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Safety Element

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SAFETY ELEMENT

Part of the General Plan of
Contra Costa County, California

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Energ. relief

Prepared by the
Contra Costa County Planning Department
October 1975

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INTRODUCTION

PURPOSE

It is the purpose of the (Public) Safety Element of the General Plan to introduce safety considerations into the planning process in order to reduce loss of life, injuries, damage to property, and economic and social dislocation resulting from fire, geologic occurrences and hazardous land use relationships. This is accomplished through an analysis of each hazard, an evaluation of the risk to life and property, and policies for hazard mitigation. The General Plan Guidelines prepared by the Council on Intergovernmental Relations (CIR) also includes the crime prevention aspects of land development such as planning for "defensible space" as suitable for inclusion in the element.

A secondary purpose of the Element is to provide the basis for planning and coordination of hazard mitigation with other divisions of County government, the incorporated cities, and state and federal agencies in order to insure that public projects, plans and programs of other government agencies reflect the public safety needs of all Contra Costa County residents.

BACKGROUND AND LEGAL FRAMEWORK

Section 65302.1 of the Government Code establishes this mandatory element "...for the protection of the community from fires and geologic hazards including features for such protection as evacuation routes, peak load water supply requirement, minimum road widths, clearance around structures, and geologic hazard mapping in areas of known geologic hazard." This document is intended to comply with the law.

Cities and counties were required to prepare and adopt a Safety Element of the General Plan by September, 1974. Contra Costa County requested and received a one-year deadline extension to September, 1975, from the State of California through the CIR.

RELATIONSHIPS TO GOVERNMENTAL AGENCIES

Implementation of a General Plan is primarily the responsibility of the Planning Agency, but also requires coordinated programs at all levels, from special districts to the federal government. Federal and State agencies participate in major construction projects such as flood control works, sewage treatment plants and highways, and set standards for State and regional programs. Utility districts

and industry consider industrial and public safety design of storage tanks and transmission lines. As the general purpose unit of government, the County, through its several departments, performs many of the actions related to public safety. The Office of Emergency Services is particularly involved in disaster response planning for the County. Although the policies of this element are applicable only to the unincorporated County, response to a major disaster requires coordinated efforts of the cities in order to insure that all residents receive the best possible public services during a disaster period and so that disaster recovery can proceed with the least possible disruption to normal life.

OVERVIEW OF SAFETY HAZARDS

In mandating a Safety Element in the General Plan the legislature expresses the generally increasing awareness and concern for the social cost and property damage potential of geologic and other natural and man-made hazards to public safety. The Urban Geology Master Plan for California, prepared by the State Division of Mines and Geology in 1973, estimates Statewide costs of over 16 billion dollars from 1970 to 2000 from landslides and flooding. These are estimated property losses, only, but indicate a significant risk of life loss and social and economic disruption. Public safety hazards in Contra Costa are related to the nature of the environment and to man's activities. The natural hazards considered in this element are unstable ground, wildfire and flooding. The activity related hazards are structural fire and those hazards created by industry, transportation, and other essential aspects of modern society which may pose a hazard to public safety by their inherent nature or by reason of being in close proximity to population centers or heavily traveled highways.

NATURAL HAZARDS

Natural hazards are not evenly distributed throughout the County, but tend to be concentrated in two types of environments: the hills and the shorelines.

Because of the extent of rugged topography and inherently slide-prone soils, slope failure is a widespread and persistent hazard in the hills. Home maintenance costs from continuous erosion and minor slides are costly to residential property owners in these areas, and maintenance and repair costs for roads and other public facilities also tend to be higher. Hill areas, largely in unirrigated native vegetation or dry-farmed grains, are subject to wildfire, particularly during the late summer and fall when unirrigated vegetation is extremely dry and easily ignited.

Contra Costa has over 70 miles of shoreline plus many square miles of the western Delta. Most of the low-lying coastal plains and Delta have been reclaimed; either leveed and used for agriculture or filled to above the floodline and used primarily for industry. Reclaimed wet lands form vital parts of the County's economy, but their use requires serious consideration for the unstable nature of the soft, wet, geologically young muds and peats which underlie reclaimed land. Reclaimed wetlands are subject to subsidence, lateral and vertical movement and, where peaty soils are exposed to the atmosphere, to peat fire and subsidence by oxidation. These inherent land characteristics can damage buildings and utility lines, heave pavements and foundations, and weaken protective works such as levees. Reclaimed areas are subject to minor to severe flooding hazards from high tides and storm waves, high river and creek flows, tsunami, standing water in poorly drained low lands, and levee failure.

ACTIVITY-RELATED HAZARDS

Hazards related to man's activities and uses of the County's resources tend to be located in population and employment centers. A significant degree of fire prevention is presently required in residential and commercial buildings, although older structures are not required to add these features. Fire district personnel have some concerns about fire prevention and extinguishment in moderately tall buildings, the type anticipated to be constructed in the County. Fires and explosions on military and industrial properties are not now perceived as a hazard to the general public, but could become so if homes, schools and shopping centers were permitted to locate in close proximity to areas where petroleum, explosives, and other hazardous materials are stored and processed. Because hazardous substances are regularly transported along the highways used for ordinary daily travel, and because large amounts of these substances pass through Contra Costa, hazardous substances in transit are viewed as being a much greater public safety hazard than the same materials stored in the more controlled environments of industrial and military properties.

It is not a purpose of this General Plan Element to speak to the multiplicity of issues and concepts which affect the community's ability to provide police and medical services. However, this element is concerned with problems in providing these services in a disaster situation which could include traffic congestion and road failure.

Oil and gas wells, natural gas and petroleum product pipelines, and airports pose some degree of hazard to the immediately surrounding areas. Separation of these uses from population centers provides a significant degree of hazard reduction.

ORGANIZATION OF THE SAFETY ELEMENT

The Safety Element consists of this text and the accompanying explanatory maps. Both the policies and maps are intended to be referenced as safety information for planning processes. Besides the introductory material, the Element includes the following sections:

- Goals and Objectives
- Acceptable Risk and Priorities for Action
- Findings and Policies
  - Geologic Hazards
  - Flood Hazards
  - Land Use and Transportation Hazards
  - Water Supply Safety
  - Public Protection Services and Disaster Planning
- Implementation

The Findings and Policies section of the element is organized around broad categories of hazards. For each topic there are findings on the nature, location and degree of the hazards, the mitigation programs presently in effect, and the relationship between hazard mitigation and planning processes. The policies delineate actions required for further mitigation, if needed, and are the major means by which public safety considerations are incorporated into the functions of the Planning Agency. The final section, Implementation, delineates specific actions needed to insure continuing and cooperative attention to public safety from all involved agencies.

The Seismic Safety Element of the General Plan, mandated in Section 65302(f) of the Government Code, has topics overlapping with the required Safety Element subject matter, notably geologic hazards and certain flood hazards. The research undertaken for the County's Seismic Safety Element and documented in its Technical Background Report has been incorporated into this document for the relevant items but seismic hazards as such are not included.

GOALS AND OBJECTIVES

> It is the goal of Contra Costa County to achieve for its residents and others present within its boundaries a minimum of risk to life, personal safety and property.

This goal is an ideal which conforms with the intent of the State in requiring that there be a Safety Element as part of the General Plan, and is also in agreement with County goals for land use, transportation, residential development, and community facilities expressed in the other General Plan elements. These goals express the need for safety in transportation, safe and stable neighborhoods, superior facilities for public protection, prevention of building in undesirable locations, and the strengthening of intergovernmental cooperation to enhance the public welfare.

Public safety and the interagency cooperation required to define acceptable risk and appropriate mitigation standards have been considered in the past, as evidenced by previously adopted goals such as those of the Open Space Conservation Plan and the 1963 General Plan. The Safety Element is a means of identifying and evaluating hazards at a specific rather than general level to enable the County to reflect public safety needs in future actions to a greater degree than in the past. Also, because this Element presents data on public safety hazards and mitigation means in one document, it will simplify the continuing efforts of the Planning Agency to reflect safety considerations in project approvals, resource and land use planning, and application of provisions of the California Environmental Quality Act to public and private projects.

In order to achieve the goal stated above, the Safety Element has the following objectives:

> To provide an overview of public safety issues in the County.
>
> To identify the nature and extent of natural and man-made features in the County which have a potential for causing a disaster of local or Countywide proportions.
>
> To identify hazards to public safety which are not acceptable because of the nature, degree or location of the hazard.
>
> To provide guidance for actions to minimize the risk of widespread and persistent hazards to life and property.

To evaluate community needs for hazard mitigation, taking into consideration both the severity of the hazard and the community resources available for mitigation.

To identify problems in the provision of emergency and disaster recovery services.

To evaluate the public safety standards and programs now in effect in order to determine if the County or any state or federal agency should improve its programs to achieve an acceptable level of public safety in this County.

To delineate the means by which public safety considerations will be incorporated into Planning Agency functions.

This Element contains but a part of a total set of General Plan objectives for the County, not isolated objectives to be enforced without consideration of other community needs. Safety considerations are one essential part of the overall need for an attractive and well balanced community.

The County development pattern is a mix of incorporated and unincorporated communities, and thus disaster "lifelines" such as emergency vehicle routes and water supply lines are important to the entire County. The public safety interests of the cities and the County include many mutual concerns. Several of the policies and program proposals in this Element are in agreement with the Safety Elements prepared by the cities, and these Elements together form a basis for cooperative hazard mitigation to benefit all County residents.

ACCEPTABLE RISK AND PRIORITIES FOR ACTION

The concept of public safety expressed in the element, and the proposed policies and programs to achieve a suitable degree of public protection, are based on the following assumptions:

1. Hazards are an unavoidable aspect of life. Not all hazards can be eliminated, nor can every degree of risk be eliminated for any specific hazard.

2. Public policy and action are appropriate to mitigate against hazards which have a high degree of risk to the general public or to a large part of the population, hazards which may have a relatively low risk of occurrence but which would be considered disasters should the event occur, and hazards which are not considered to have a disaster potential but which are persistent safety problems with a history of occurring in the County.

3. Through the dissemination of information and public discussion satisfactory judgments can be made as to the levels of monetary, environmental and social costs appropriate to mitigate hazards to public safety.

The policies of this element are not intended to remove all risks associated with each specific type of hazard, but when implemented will reduce risks to life and property from certain natural and man-made events, and will lead to greater life safety in case of general disaster.

The determination of acceptable and unacceptable risk requires judgments based on weighing several factors including the nature of the hazard, the frequency, or risk, of a damaging event associated with the hazard, and the relative number of persons exposed to the risk. The degree or intensity of any specific hazard is a major consideration in public mitigation efforts. Thus, hazards with a high life-loss potential are less acceptable than hazards which primarily affect property, and hazards which could impact entire communities are less acceptable than hazards which may impact relatively few persons. For hazards to disaster "lifelines" (including water supply, emergency services, evacuation routes, and medical and mass care facilities) only a very low degree of risk is considered acceptable since these facilities and functions are critical to disaster recovery for entire communities.

Exposure to the natural hazards considered in the Element is often taken voluntarily. Persons who choose to purchase property on unstable ground or subject to wildfire and flooding are usually aware of the potential hazard. Involuntary or unrecognized risks, such as exposure to hazardous substances on the other hand, are taken unknowningly. Voluntarily taken risks are not necessarily acceptable from the public point of view because property owners have expectations that grading and building regulations, fire services, and flood control works will provide a significant degree of risk reduction. The greater capital cost of public facilities in hazardous areas, plus higher maintenance costs, represents a disproportionate share of tax revenues for hazard mitigation. Thus, there is a public interest in the conservation and development of areas subject to natural hazards and in alternative means of providing for public safety.

For the hazards discussed in the Element specific degrees of risk have been determined to be unacceptable and mitigation measures have been established through standards, permit procedures or regulations. These programs are the responsibility of many agencies, ranging from local fire districts to the federal government. The following list of programs and regulatory agencies is representative of the range of hazard mitigation efforts now undertaken at several government levels.

Flood control project standards vary by agency. Standards are set by the U.S. Army Corps of Engineers, the Federal Insurance Administration, State Department of Water Resources, and the County Flood Control District's Ordinance Code.

Fire prevention, detection and extinguishment requirements are set by the Uniform Building Code and Fire Code, and enforced by the Contra Costa Building Inspection Department and the Fire Bureau of each fire district or department. Road widths for fire fighting equipment are established by the Fire Bureau and enforced by the Planning Agency and Public Works Department.

Weed abatement requirements are enforced by the Fire Bureau and the County Public Works Department.

Minimum grading standards and approval of grading projects are the responsibility of the County Building Inspection Department.

Permits for the transportation of hazardous substances are granted by several State agencies. Truck routing is determined by the

California Highway Patrol. Safe-stop locations for rail transported explosives are determined by railroad companies. Bridge Authorities grant permits for the passage of explosives and corrosives.

Emergency water supply requirements for fire fighting are based on Fire Bureau standards and are implemented by the several water districts and water service areas.

Delta levees are maintained by the State Department of Water Resources and several reclamation and improvement districts under the State Reclamation Board.

Well and septic disposal system permits and small water systems licenses are granted by the County Department of Health.

Larger dams are regulated by the State Division of Safety of Dams.

Evacuation routes and provisions for the passage of emergency vehicles in a disaster are a factor in disaster planning by the incorporated cities and the County through the coordination of the County Office of Emergency Services.

Gas and oil wells, fuel pipelines and industrial uses of hazardous materials are provided with levels of industrial safety considered appropriate by the owners. Some uses are regulated by the State; for example, new petroleum tanks are inspected by the California Department of Industrial Safety before they are put into service.

Permits for the use of radioactive materials are granted by the State Department of Health. Radioactive detection devices are provided by Federal funds.

Even if not explicitly stated, there is an underlying assumption in these programs that the remaining risk is acceptable. It is a purpose of this Element to examine and evaluate the effectiveness of programs and regulatory processes to determine whether or not the residual risk is indeed acceptable. Policies for new or changed programs and actions indicate areas in which improvements are perceived as needed to achieve an acceptable level of risk.

Recommendations for the incorporation of public safety considerations into Planning Agency functions have been assigned a high priority because this is the primary purpose of the State mandated Element. Recommendations for actions

by other agencies, within and without County government, are equally essential to public safety in the County. Of these, actions which would mitigate hazards to life or hazards to disaster recovery should be considered to have a higher priority than actions which would primarily affect the safety of property.

FINDINGS AND POLICIES

GEOLOGIC HAZARDS

GOAL: To provide means of mitigating geologic hazards to property from unstable hillside slopes and reclaimed areas.

FINDINGS

The major geologic hazard areas in Contra Costa County, aside from earthquake fault lines, are unstable hillside slopes and reclaimed areas. Slopes may suffer slumping, soil slips, landslides and rock slides, all potentially damaging downhill movements of earth materials. The reclaimed wet lands of the west and north coasts and the Delta, whether or not they are filled by imported materials, are subject to lateral and vertical movements because they are underlain by soft, wet, poorly consolidated geologically recent muds and peat. Areas in the County where there are landslide deposits and reclaimed lands are shown on Map 1. Level or gently rolling valley floors, coastal plains, and the east County valley lying between the Delta and the Diablo foothills have an extremely low risk of earth movements in the absence of earthquake groundshaking.

UNSTABLE SLOPES

The Urban Geology Master Plan for California, prepared by the Division of Mines and Geology in 1973, estimates that landslide costs in the State will total almost $10,000,000,000 between 1970 and 2000, as compared with an estimated $21,000,000,000 in earthquake damages during the same period. Lack of previous attention to slope failure damages is probably due to their low potential for causing life losses and widespread disasters, but it is becoming evident that in the aggregate persistent slope failure problems are a costly public safety hazard. Potential damages are high in Contra Costa because of the extent of inherently unstable terrain and because development is increasingly moving into the hills.

Landslides, rock slides, soil slips, and the failure of cut or fill slopes cause damages to public and private property in Contra Costa each year. Slope failure is most frequent in "wet years" with more than average rainfall, but can occur at any time. A survey of structurally damaging slides conducted by the U.S. Geological Survey for the 1968-69 rainy season revealed an estimated $5,000,000 in slide damages in the County, out of an estimated $25,000,000 in the 9-County Bay Area. Road damages accounted for a large share of these costs.

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SAN PABLO BAY

SAN FRANCISCO BAY

Landslide Deposits

Filled Reclaimed Areas

Reclaimed Areas

Map 1
Geologic Hazards

Source: USGS, 1971 and
CCCPD, 1975

Landslides may occur on slopes of 15 percent or less in unstable areas. However, the risk is greater on steeper slopes, with existing old slide deposits the most subject to continuous failure. The life risk directly from slope failure is believed to be minimal, but should a slide close the only access road during a fire, as could result from an earthquake, life losses could occur. A disaster affecting hundreds or thousands of persons is not anticipated to result from slope failure. Rather, there is a persistent risk of property damages to individual property owners and to publicly owned property such as roads, schools, reservoirs and water canals.

Grading tends to reduce slope stability so that road cuts and the cut-and-fill pads typically prepared for hillside housing carry a greater risk of slope failure than undisturbed hillsides. However, fill slopes engineered to today's standards may result in a more stable situation than in nature, particularly where smaller slide deposits are improved. On any bedrock formation solid, well consolidated rock has less tendency to slide than areas of weathered and fractured bedrock, but the clayey nature of many soils, which makes them slide-prone, is prevalent throughout the County. Deep-rooted vegetation is believed to have the beneficial effect of holding slopes in place, so clearing brush and trees will make any slope more susceptible to failure. Cut slopes, being steeper and extremely difficult to revegetate, tend to be less stable than well engineered fill slopes. All else being equal, the steeper the slope the greater the risk of slope failure. Map 2, Slope Steepness, indicates the distribution of steep areas in the County.

The County Grading Engineer estimates that no more than 0.01 percent of all graded slopes fail to the degree that property is totally destroyed. This is considered an acceptable risk, given the generally unstable nature of slopes in the County. The extent to which property is damaged short of destruction is not well known, but it is a constant hazard and financial burden to property owners in hilly areas.

Safety Programs

As part of the San Francisco Bay Region Environment and Resources Planning Study, the U.S. Geological Survey has prepared a series of maps showing the distribution of landslides in Contra Costa County. A composite is reproduced in Map 1. Approximately 2,000 landslides, ranging in length from 50 feet to more than 1,000 feet across, were mapped in the County. The maps are preliminary in the sense that they are based exclusively on analyses of aerial photographs and have not been entirely substantiated by field investigations.

N
1" = 8,000'

CARQUINEZ STRAITS
SUISUN BAY
SACRAMENTO RIVER
SAN JOAQUIN RIVER
SAN PABLO BAY
SAN FRANCISCO BAY
Rodeo
HERCULES
PINOLE
SAN PABLO
RICHMOND
Pacheco
CONCORD
PITTSBURG
West Pittsburg
ANTIOCH
Oakley
Knightsen
BRENTWOOD
Byron
WALNUT CREEK
LAFAYETTE
Alamo
Diablo
Danville
San Ramon
CLAYTON
MARSH CREEK RESERVOIR

Slopes

30% and over

15-30%

0-15%

Map 2
Slope Steepness Categories

Source: USGS, 1970

The County Building Inspection Department records slides which are reported to the Department or observed in the field by the inspectors. These reports reveal a trend indicating that engineering standards are more rigorous now than 12 to 15 years ago, both for road engineering and private property. Failure of cut slopes, which are permitted to be steeper than fill slopes, and unvegetated soil exposed to the elements continue to be stability problems.

The County Grading Ordinance, administered by the Building Inspection Department, specifies the maximum permissible slopes for cut and fill, and standards for fill engineering. The present code, adopted in 1968, is believed to provide a significantly lower risk of slope failure than the previous code, particularly by applying higher standards for engineered fill and by requiring cut slopes to be laid back at a 2:1 angle rather than the former steeper 1.5:1 angle. These requirements do not apply to roads which commonly are bordered by almost vertical cuts and fills, and thus are more subject to various forms of slope failure. The Grading Ordinance specifies that a fill may not toe out on a slope greater than 30 percent (approximately 3:1), but does not provide a standard for determining a general category of slope steepness which is generally subject to a high risk of failure.

The 1963 Contra Costa County General Plan refers to over 99,000 acres of land, having an average slope in excess of 26 percent, as being "not readily developable" and "undevelopable", recognizing the cost and engineering difficulties of grading steep slopes as well as their inherent unsuitability. The developability limit of 26 percent agrees in general with customary limits throughout the Bay Area, and varies only slightly from the 30 percent standard reference developed by the State Division of Mines and Geology as the maximum developable slope, which is a statewide reference, not intended to reflect special conditions such as clayey soils prevalent in this County.

The State Division of Highways does not attempt to engineer-out all slope problems at the time of highway construction. It has been found to be less costly to budget a contingency fund to make repairs as needed. Calculated as a percentage of the construction budget, the contingency varies depending on the known slope failure-proneness around specific sections of highway, and may be as much as 30 percent. The precise amount assigned to slope repair on Highway 24 from the Caldecott Tunnel east to Walnut Creek, where slope failure is a persistent problem, is not known but has been estimated at 10 to 15 percent of construction costs.

The County Public Works Department assigns approximately two-thirds of the annual road budget to road maintenance. A disproportionate share of these

funds is required to maintain and repair County roads in the hills. If roads continue to be constructed in hilly areas to serve increased hillside development, maintenance and repair costs can be expected to increase.

RECLAIMED AREAS AND COASTAL FILL

Several hazards to life and property are associated with reclaimed areas underlain by soft, poorly consolidated, water saturated bay muds and peat. These materials have very little weight-bearing strength, are subject to sudden or slow lateral and vertical movements, and have been known to liquify and flow across virtually level surfaces. Levee failure is a strong probability in the Delta in the next few years, based on the past history of levee instability.

Reclaimed wetlands may move slowly laterally and vertically, primarily as a result of adding the weight of fill, structures, and paving (static loading). They may subside from excess withdrawal of groundwater (Santa Clara County) or from the exposure of organic peat to wind and air. Levees slowly sink by their own weight. Risks to life could result from the collapse of buildings or sudden levee failure causing disastrous flooding. Property damages may occur suddenly or slowly over time. The performance of landfill placed over muds, the common practice when relaimed wetlands are used for a purpose other than agriculture, depends in part on the careful engineering of the fill. Even so, the performance of the underlying material is unpredictable. Some older fills in the County are of an undetermined but highly varied composition which is not considered as stable as more recent fill work made to standards established by the Corps of Engineers and soils engineers.

Safety Programs

Projects to reclaim, fill, or dredge wetlands from the County border near Point Isabel north and east to Stake Point east of Martinez are required to have permits from the Bay Conservation and Development Commission. The Commission is concerned with the uncertain stability of fills and has had surveys and engineering studies made of performance characteristics. Permits to reclaim, fill, or dredge wetlands anywhere in the County require a permit from either the San Francisco or Sacramento Districts of the U.S. Army Corps of Engineers. Proposals for docks, piers, pilings, or other structures in wetlands are reviewed by a multiplicity of state and local agencies, each with its special concern for the potential consequences of such actions. The State Department of Water Resources and the Delta Advisory Planning Council have identified the Delta as a multiple hazard area because of the unstable nature of the levees and the land surface.

GEOLOGIC HAZARDS AND PLANNING PROCESSES

The enforcement of the grading ordinance and the engineering standards of the Uniform Building Code is the responsibility of the County Building Inspection Department. Public facilities design, including suitable road foundation design, is the responsibility of the County Public Works Department. Important as these functions are in providing safety from geologic hazards and avoiding extreme public maintenance and repair costs, the appropriate standards are applied after the decision has been made to open an area of the County to development, and after the design of projects is approved. These earlier decisions are the task of the Planning Agency, which therefore has the primary responsibility for determining whether or not a geologic hazards is associated with land areas to the degree that the risk should be avoided by not exposing the area to development. In some areas geologic hazards may be manageable with special care and a greater than ordinary degree of engineering. For ordinary types of residential development utilizing the cut-and-fill pad, the 1963 General Plan standard of lack of suitability for slopes over 26 percent is reasonable and should be reaffirmed.

Reclaimed and filled wetlands represent a vital resource for the economy of the County for industrial and agricultural uses. Because of the inherently hazardous nature of the ground, however, they are not suitable for the location of large residential populations.

Information is not available for mapping geologic hazards at a level of detail which would enable all geologic hazards areas in the County to be precisely described. However, there are excellent indicators of hazardous and non-hazardous areas, including Countywide maps of geologic units with varying tendencies to slide, landslide deposits, various degrees of slope steepness and the approximate boundaries of reclaimed areas. These are satisfactory references for identifying areas for appropriate general densities and types of uses in General Plan preparation and are also adequate to identify areas in which geology and soil should be thoroughly investigated prior to project approvals. At the present time only detailed investigations of each proposed development site can reveal the exact degree of geologic hazard associated with the property and the appropriate means of site engineering to minimize those hazards.

POLICIES FOR GEOLOGIC HAZARDS

1. Proposed extensions of urban or suburban land uses into areas characterized by slopes over 15 percent and/or generally unstable land should be evaluated with regard to the safety hazard prior to land use decisions such as General Plan amendments, rezonings, or project approvals.

2. Slopes over 26 percent are not suitable for types of development which require extensive grading or other land disturbance.

3. Lots on hillsides formed for resale as lots, rather than as part of a subdivision development, should be large enough to provide flexibility in finding a stable buildable site and driveway location at a future time.

4. The County should not accept dedication of roads in hilly areas which, in the opinion of the Public Works Department, would require an excessive degree of maintenance and repair costs.

5. The Building Inspection Department should analyze its slope failure records and, based on its findings, should recommend any needed improvements in the grading ordinance.

6. Substantial urban or suburban development in reclaimed wetlands should not be permitted.

FLOOD HAZARDS

GOAL: To provide public safety by avoiding areas which may pose a risk to life from flooding, and to mitigate flood risks to property.

FINDINGS

Flooding in Contra Costa County may have several causes. In many of the flood-prone areas of the County the risk to life from flooding is low, particularly in areas subject to creek overflows, although property damages may be a moderate risk. In reclaimed areas in which the land surface lies several feet below the high tide line, the risk of life loss and severe property damages is high.

Causes of flooding include:

- Levee failure
- High tides and storm waves
- Creek overflows
- Standing water from excess rainfall
- Dam failure
- Tsunami

Areas subject to flooding from levee failure, creek overflows, and standing water are shown on Map 3, taken from a preliminary determination of flood plains prepared by the U.S.G.S. in 1973.

LEVEE FAILURE

A major levee break can cause severe, perhaps total, property damages and would also represent a hazard to life. Big Break and Frank's Tract are flooded islands, and Quimby Island has been flooded several times. As reclamation costs are rising faster than the value of agricultural land and products, it may not be economically feasible to reclaim other Delta islands once they are entirely flooded. Several emergency repairs are made somewhere in the County's Delta every year. Most of these emergencies are caused by high water overtopping and eroding the levee. Aside from the exceptions noted, emergency repairs have prevented severe flooding. Direct Agreement Levees along shipping channels have been constructed by the U.S. Army Corps of Engineers and are required to be maintained to State and Federal standards. All other levees are maintained as well as possible by the respective Reclamation Districts without any requirements to meet engineering standards or minimum heights (Map 4).

N

1" = 8,000'

CARQUINEZ STRAITS

SUISUN BAY

SAN PABLO BAY

SAN FRANCISCO BAY

SACRAMENTO RIVER

SAN JOAQUIN RIVER

Crockett

Port Costa

Rodeo

HERCULES

PINOLE

MARTINEZ

Pacheco

West Pittsburg

PITTSBURG

ANTIOCH

Oakley

Knightsen

BRENTWOOD

El Sobrante

SAN PABLO

RICHMOND

CONCORD

PLEASANT HILL

CLAYTON

EL CERRITO

Kensington

LAFAYETTE

WALNUT CREEK

Orinda

Mt Diablo

Alamo

Diablo

Danville

Canyon

Moraga

San Ramon

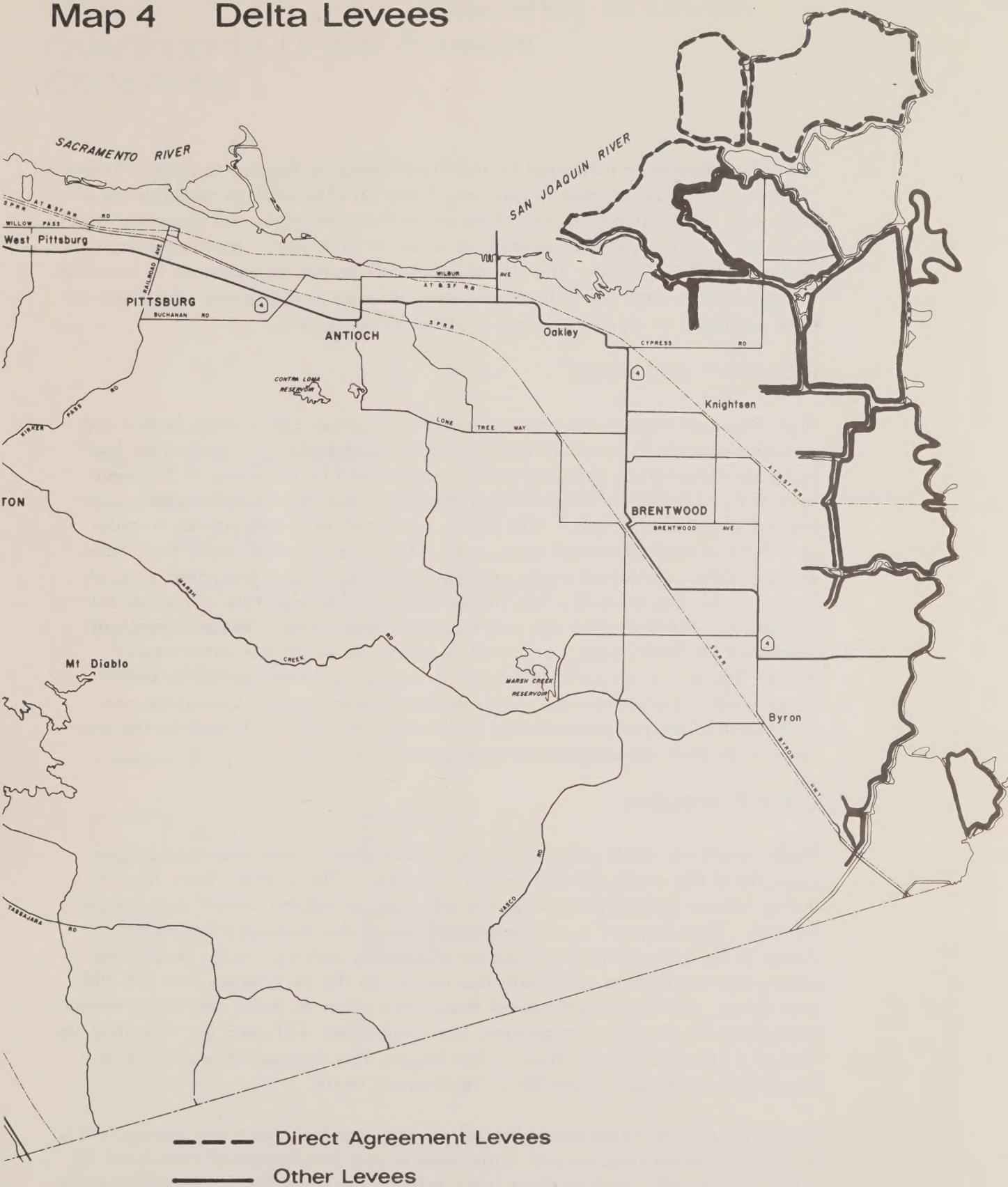
Byron

Areas subject to inundation from the 100 year flood

Map 3
Flood Hazard Areas

Source : USGS Interpretive Report 4, 1974

Map 4 Delta Levees



Direct Agreement Levees

Other Levees

Source: State Department of Water Resources, 1973

The latter have been estimated by the State Resources Agency to have a failure risk of one to eight percent in any year (Map 5). The critical combination of high river flows, high tides and storm waves is estimated by the Resources Agency to occur in the Delta an average of once in three years, approximately a 30 percent risk in any year. The risk of levee failure can be expected to increase in the future through the natural processes of levee slumping and island subsidence estimated at an average rate of three inches a year.

HIGH TIDES AND WAVES

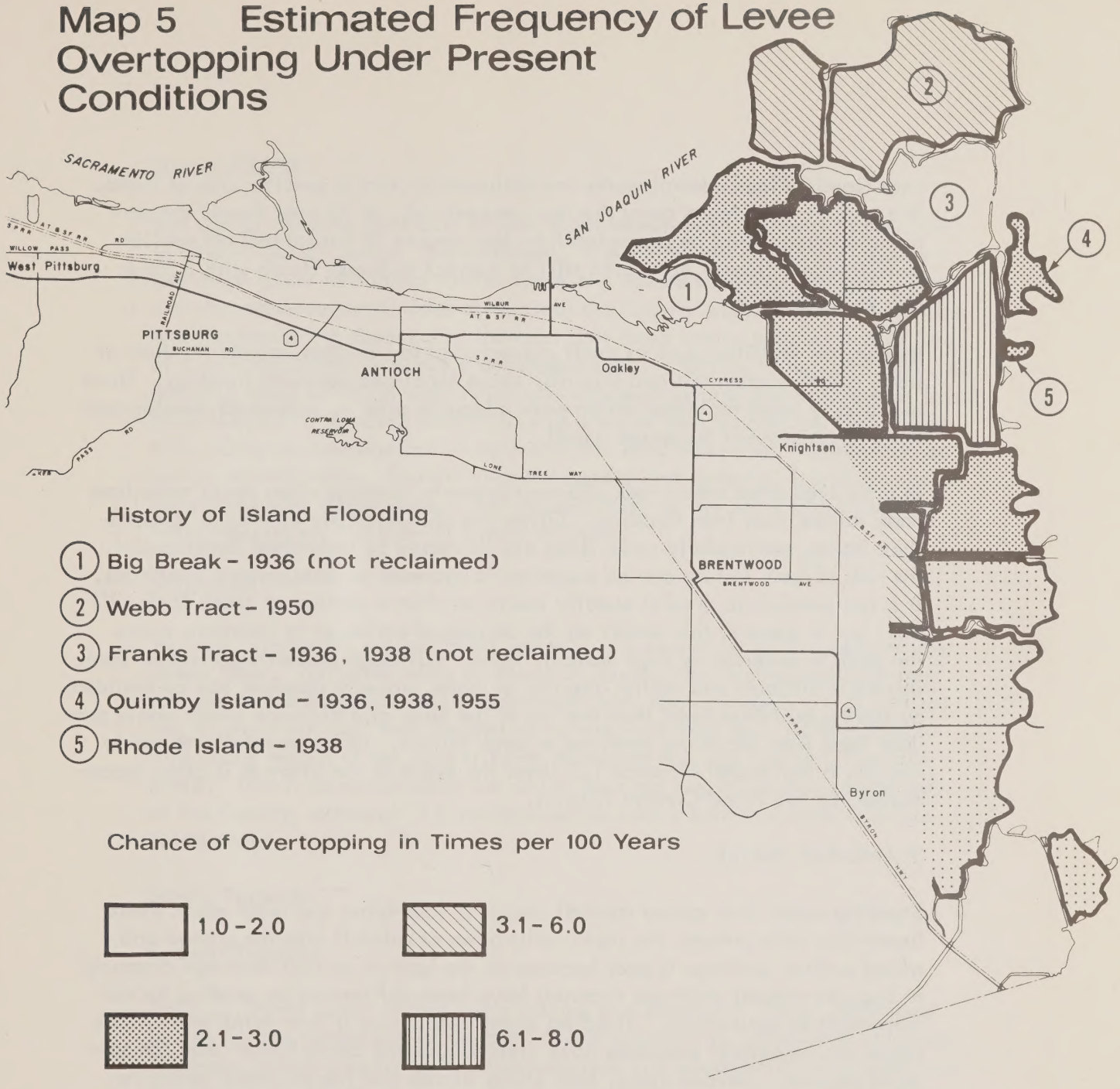
High tides and storm-driven waves occurring together can overtop levees and embankments and by wave actions can erode earthworks. Protection for low-lying reclaimed areas approved and/or constructed by the Corps of Engineers such as Point Isabel in Richmond and the Direct Agreement Levees along commercial shipping channels in the Delta, are faced with rock rip-rap in order to withstand boat-generated wave wash. This also provides safety from storm waves. Other reclaimed areas, notably in the Delta, are protected by earth levees which may be only a few inches above higher high tide elevation and thus are subject to erosion and overtopping during storms. Bethel Island and Webb and Holland Tracts, reclaimed islands adjacent to the water area of Frank's Tract, are particularly subject to erosion and overtopping by storm waves wind-driven across the wide expanse of open water. Low-lying coastal areas that are not protected by earthworks may also be flooded by the combination of high tides and storm waves.

CREEK OVERFLOWS

Creek overflows result when the surface runoff from a watershed exceeds the capacity of the creek channel to carry the flow. This is most likely to occur during intense spring storms when the soil is saturated and cannot absorb much rainfall. Development in a watershed increases the frequency and height of floods in the lower watershed because of grading, paving, roofs, and storm drains, but would have relatively less impact on the very large, low risk 100 year flood. Smaller more frequent floods may occur on major and minor creeks throughout the County. In general, a natural creek will carry no more than the flow of a 10 to 20 percent flood. Any larger, less frequent flow may cause flooding to some degree outside of the channel itself.

Flood hazards are estimated as the risk in any year (such as a one percent risk), or as an expected frequency of return over a very long period of time (such as a 100 year flood). Both of these terms refer to the same flood. A smaller more frequent flood could be expressed as either the four percent risk flood or the 25

Map 5 Estimated Frequency of Levee Overtopping Under Present Conditions



History of Island Flooding

1. Big Break - 1936 (not reclaimed)
2. Webb Tract - 1950
3. Franks Tract - 1936, 1938 (not reclaimed)
4. Quimby Island - 1936, 1938, 1955
5. Rhode Island - 1938

Chance of Overtopping in Times per 100 Years

- 1.0 - 2.0
- 2.1 - 3.0
- 3.1 - 6.0
- 6.1 - 8.0

Source: Department of Water Resources, State of California, 1974

year flood. Flood control works are designed to carry a specific size of flood. If a project is designed carry the four percent risk, or 25 year flood, the surrounding area would be protected from that degree of hazard and all smaller more frequent floods, but would still be subject to larger floods with a lower risk of occurrences.

Inadequate facilities such as small culverts and low bridges impede the flow of storm runoff in channels and thus may cause localized upstream flooding. These are usually older facilities which were adequate prior to watershed development and the consequent increased runoff.

In urbanized areas near creek channels property damages often result more from bank failure than from flooding. Given the characteristic of streams to erode their banks, particularly when flows are increased by watershed development, the risk of bank failure can be expected to increase as development continues. It is not possible to predict exactly where or when a section of creek bank will fail, but in general this occurs on the outside of curves or in locations where the bank is undercut by high velocity flows. Although preventing channel bank failure is difficult and costly, the risk of major property damages can be avoided by setting buildings back from the top of the bank at a distance which would prevent them from becoming involved in bank failure. As a rule-of-thumb safety margin, a horizontal distance 1.5 times the depth of the channel is often recommended by the Flood Control District.

STANDING WATER

Standing water from excess rainfall occurs in low-lying and level areas where impervious soils prevent the rapid infiltration of rainfall into the ground and where surface drainage is poor because of the lack of natural drainage channels or because natural drainage channels have been obliterated by grading for development or agriculture. Standing water also occurs in low-lying areas along creeks where natural processes have created channel banks higher than the surrounding area. Leveed areas, both Delta islands and the mainland below ten feet above mean sea level, are subject to standing water which must be pumped out to the sloughs. Damages to crops and other property may result, particularly in a wet year in which water may stand on the land for weeks at a time. There are no standard risks for this type of flooding, but many areas subject to standing water experience inconvenience and minor property damages virtually every year. Hazards to life from standing water are low, but there is a significant risk of well contamination which is discussed in the section on water supply safety.

DAM FAILURE

The risk of flooding from dam failure is not known but is believed to be low in Contra Costa County. Nevertheless, if a major dam should collapse urban areas could be subject to life losses and severe property damages. There are also numerous small dams throughout the County which impound irrigation and stockwatering ponds. For the most part these are so located that failure of a dam would not inundate a developed area. Projects to be constructed in outlying areas or which would protrude into agricultural districts may be found to be subject to flooding from failure of a minor dam located off the project site. Only an examination of each specific area can reveal whether or not such a hazard exists. Determining the hazard and potential inundation area associated with larger dams is the responsibility of the State Department of Water Resources, Division of Safety of Dams.

TSUNAMI

Tsunami, commonly called "tidal waves", are caused by earthquakes on the ocean floor. Estimates made by the U.S. Geological Survey indicate that the risk of a damaging event is extremely low, approximately a 0.5 percent risk in any year, and that the degree of hazard is also low, having a maximum runup height of ten feet at Point Richmond and one foot at Carquinez Strait. This is an acceptable risk which does not require action on the part of the County, although it is recognized that some boat and dock damages could occur.

Safety Programs

Federal Programs

The U.S. Army Corps of Engineers designs and constructs Direct Agreement Levees for the protection of reclaimed land adjacent to commercial shipping channels, grants permits for land reclamation and coastal fill, and constructs flood control projects on major regional creeks in urban areas. Projects are usually designed to prevent flooding from the one percent risk flood (the 100 year flood), or a greater flood considered by the Corps to be a suitable degree of flood protection in urban areas. Additional protection from storm waves is provided in the Delta and other coastal areas.

The Soil Conservation Service, U.S. Department of Agriculture, participates with the County Flood Control District in flood control projects in rural regions. Protection from the two percent risk flood (50 year flood) is considered satisfactory for agriculture.

In the last few decades there have been constant and dramatic increases in federal expenditures for both flood control works and flood disaster relief. In order to shift part of the increasing federal cost of flood disaster relief to owners of the flood prone property, National Flood Insurance Act of 1965 amended by the Flood Disaster Protection Act of 1973 provides for a Flood Insurance Program and the enactment of flood plain regulations at least as restrictive as federal minimum standards. In order to insure that cities and counties will join the insurance program, financing for flood prone property, including purchase, improvements, and contents is not available from any federally connected lender if the jurisdiction has not entered the program by a specific date. Since November 4, 1975, when the County entered the program, owners of property in designated flood-hazard areas, and in any other areas, may purchase insurance voluntarily. Lending institutions will require insurance on loans for the purposes noted above when the property securing the loan is in a flood hazard area. The Department of Housing and Urban Development, Federal Insurance Administration, supplies maps showing areas subject to the 100-year flood. These are the official "Flood Hazard Areas" for administering the National Flood Insurance Program. Flood elevation (height) maps are expected to be issued by June, 1978. At that time new buildings and property protected from flooding may have much lower insurance rates available. Subsidized insurance rates will still be available on existing buildings.

State Programs

The California Department of Water Resources is concerned with the increasing risk of levee failure throughout the Delta and potential subsequent loss of highly productive agricultural lands. The Department has recommended that the State accept some form of responsibility for maintaining Delta levees. The final form of maintenance has not been determined, nor has the legislature yet decided to take on this role.

The Department of Water Resources and Corps of Engineers jointly construct and maintain Direct Agreement Levees along shipping channels. These may or may not be constructed to Corps standards for the 0.5 percent risk flood (200 year flood) plus six feet of freeboard to resist wave action on main shipping channels and three feet of freeboard on lesser channels. Other levee maintenance is presently the responsibility of Reclamation Districts and the Bethel Island Improvement District, acting under the State Reclamation Board. No standards for elevations or engineering for these levees are required. Each district maintains its levees as funds and manpower permit.

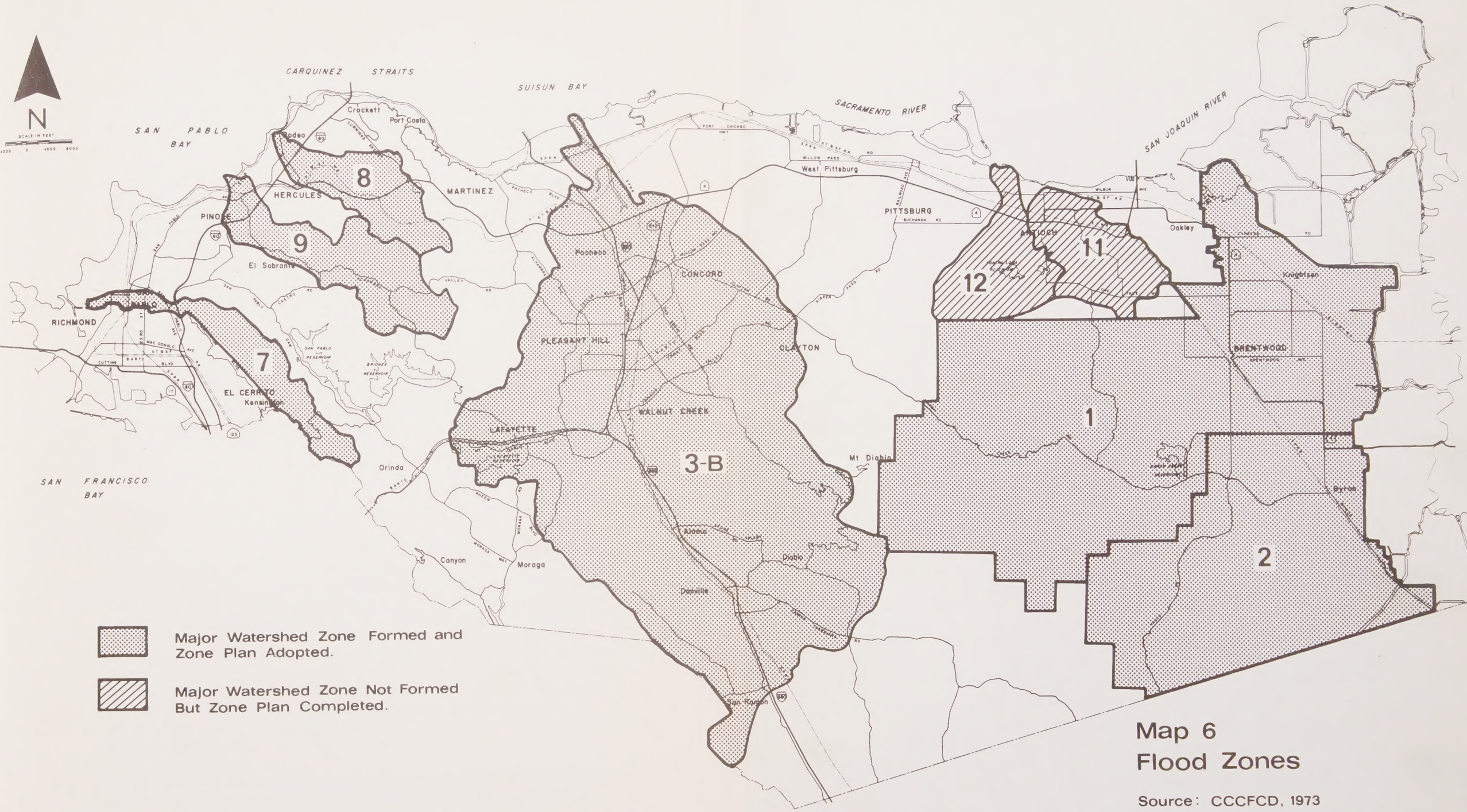
The Department of Water Resources, Division of Safety of Dams, determines the safety of major dams. Dam inundation areas are delineated by dam owners subject to approval of the State Office of Emergency Services. Dam inundation maps are received by the County as they become available.

County Programs

The Contra Costa County Flood Control and Water Conservation District, a division of the County Public Works Department, plans and constructs flood control works in the County, in partnership with the Corps of Engineers, Resource Conservation District, and Soil Conservation Service. It is the sole design and construction agency for many County flood control projects. The District also approves drainage and flood control works to be constructed by land developers. County projects are based on the establishment of Flood Zones (Map 6) and plans for each zone which are adopted by the Board of Supervisors. Segments of projects in each zone are constructed as development proceeds and zone tax revenues are accumulated. Major watersheds for which zones have been formed and plans adopted include the Central County Walnut Creek basin, East County Marsh Creek and Kellogg Creek basins, and several smaller creek basins in West County. In the Antioch Area zone plans have been prepared but zones have not been formed, thus property tax revenues are not accumulated. Other basins in the County do not have adopted plans or zones.

The Contra Costa County Ordinance Code provides the drainage and flood control standards applied by the Flood Control District. Major channels are designed to cover the two percent risk flood (50 year flood), secondary channels are designed for the four percent risk flood (25 year flood), and minor channels and drainage works are designed for the ten percent flood (10 year flood). The District acquires rights-of-way in fee on projects constructed jointly with federal agencies. The 1973 Contra Costa County Flood Control Act permits the District to acquire rights-of-way in fee on projects constructed solely by the District, but normally only an easement is acquired. As part of its review of drainage plans for proposed projects the District frequently recommends that structures be set back from stream channels in order to prevent property damages from bank failure, but it is not empowered to enforce this recommendation.

The County Ordinance Code specifies standards for levees, including floods from which subdivisions must be protected and the minimum elevation of street curb tops for reclaimed areas. For the entire County coastline, levees "shall provide protection from tides, flood flows, and waves created by wind



Major Watershed Zone Formed and Zone Plan Adopted.

Major Watershed Zone Not Formed But Zone Plan Completed.

Map 6
Flood Zones

Source: CCCFCD, 1973

action." East to Carquinez Bridge, curb top elevations shall be no lower than 7.5 feet above mean sea level; from Carquinez Bridge to Chipps Island, tops of curbs shall be no lower than 8.5 feet, and east of Chipps Island, curb tops shall be no lower than 9.5 feet. This provision has been informally waived by the County in some instances and enforced in others.

The County Ordinance provides that the drainage required in subdivisions shall drain into an adequately sized channel if the outlet is an engineered channel. If the outlet is a natural waterway, the natural channel is not required to be adequate to carry the runoff from the subdivision. This provision can lead to off-site flooding and channel bank failure damages downstream from developments and, where off-site damages would occur in basins without established zones, there are no property tax revenues to pay for needed channel engineering downstream from projects.

The County Ordinance enables the Flood Control District to approve innovative drainage plans for subdivisions, such as check dams and ponds, but unlike conventional engineered channels, the District is not empowered to take on maintenance responsibilities. This encourages developers to utilize conventional engineered channels even though other methods could provide a greater degree of damage prevention for downstream natural waterways and their adjacent properties. Protection for downstream property, particularly in areas which have no zone and thus no funds for channel improvements, can be provided by ordinance changes or conditions of approval.

FLOOD HAZARDS AND PLANNING PROCESSES

Plans for flood control works are undertaken by several local, State, and federal agencies, each with its own set of standards for appropriate levels of protection. There is a need to review and coordinate these standards so that flood control works, land use plans and project designs can satisfy the requirements of various agencies for a mutually acceptable degree of hazard mitigation. In many cases the actual size or elevation of projects would not differ greatly under the present various standards. There is only a small difference between the 100 year and 200 year floods, for example, and approximately a fifteen percent to twenty percent difference between the 50 year and 100 year floods. The problem lies partially in defining project size, but is largely due to the confusion and misunderstanding which can occur when planning is based on several different standards.

Because flooding has several causes the means of providing protection also differ, ranging from levee construction to the designation of evacuation

routes, depending on the nature and location of the hazard. Project proponents and public agencies need to be informed on the range of means suitable for each site or area in order to provide an adequate degree of flood damage prevention at the least monetary and environmental cost. This can be achieved by maintaining a set of flood hazard maps in the Planning Department, establishing a system of updating and correcting them as new information is received, coordination with all agencies and jurisdictions which have an interest in flood prevention, and preparing the flood plain management regulations required by the National Flood Insurance Program.

In order to be consistent in requirements to protect property from damages from creek bank failure, an ordinance stating the minimum acceptable standard is needed. Developing this regulation is primarily the responsibility of the Flood Control District. A minimum standard has not been established in the County, but the recommendation of the District for projects in the past, a minimum setback of 1.5 times the depth of the channel, is reasonable in that it would allow space for an undercut bank to slump or fall to a stable angle without endangering homes or other buildings. In the absence of an adopted creek setback ordinance, the Planning Agency can require a setback as a condition of approval where this is recommended by the Flood Control District.

All of the flood hazards noted in this section, and the estimated risks where such information is available, are appropriate for discussion in Environmental Impact Reports.

POLICIES FOR FLOOD HAZARDS

1. A uniform set of flood damage prevention standards should be established by the cooperative efforts of all County, State, and Federal agencies with responsibilities for flood control works and development in flood-prone areas in Contra Costa County.

2. The Federal Insurance Administration should be encouraged to prepare flood elevation maps for Contra Costa County no later than June, 1978.

3. In developing areas which are subject to the provisions of the Flood Insurance Program, and for which there is no reasonable expectation of flood control project participation by the Corps of Engineers, and in which a significant number of properties will be affected, the

Flood Control District should be permitted to construct 100-year flood protection works when so directed by the Board of Supervisors.

4. Planning Agency and Flood Control District review of any significant project proposed for areas in the County which are not presently in Flood Zones should include an evaluation of the potential downstream flood damages which may result from the project.

5. In order to protect lives and property, intensive urban and suburban development should not be permitted in reclaimed areas unless flood protection in such areas is constructed to the standards of the Flood Disaster Protection Act of 1973.

6. To provide a satisfactory level of flood protection for the vital Delta agricultural region, the County should actively encourage the State to proceed with a Delta levee maintenance program.

7. The County should consider adopting a creek setback ordinance for residential and commercial structures, based on a formula recommended by the Contra Costa County Flood Control District, to prevent severe property damages from bank failure along natural water courses.

8. The County Flood Control District should be encouraged to proceed with drainage improvements in areas subject to flooding from inadequate facilities, and to insure that additional new drainage facilities, including road culverts and bridges, are designed to pass the flow specified in the Contra Costa Ordinance Code.

9. Development proposals should be reviewed with reference to dam failure inundation maps as these become available in order to determine evacuation routes.

LAND USE AND TRANSPORTATION HAZARD

GOAL: To provide public protection from hazards associated with certain land uses and the transportation of hazardous substances.

FINDINGS

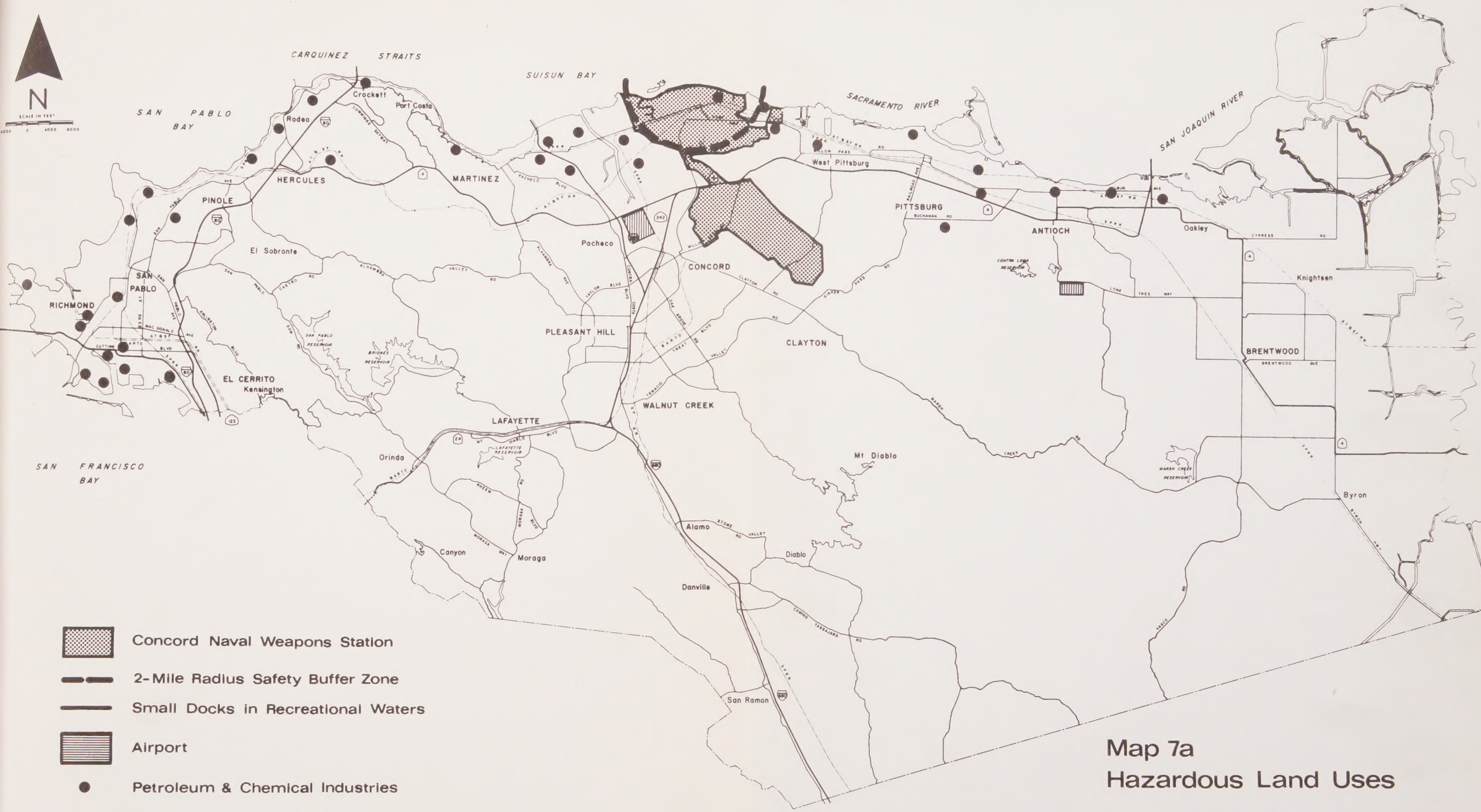
Hazardous land uses and the transportation of explosive, flammable, toxic, or otherwise hazardous substances are not unique to Contra Costa County. However, since this is a County with extensive heavy industrial development along the west and north coasts, with a pattern of major freeways and highways passing through urbanized areas which carry many shipments of hazardous substances each day mixed with normal traffic, it is appropriate to evaluate the potential public safety hazard from these factors. The land uses considered include airports, the Concord Naval Weapons Station, petroleum and chemical processing plants, oil and gas wells, petroleum product and natural gas pipelines, and land use hazards to navigation (Maps 7a and 7b). Transportation of hazardous substances is concerned with the uncontrolled highway environment which could cause a minor traffic incident to become very serious if extremely hazardous materials were involved.

HAZARDOUS LAND USES

Airports

The public safety hazard from airport uses is primarily the risk of a plane crash off the airport property. Vibrations or airwaves can also damage property, but this hazard is more associated with very large aircraft which do not at present use airports in the County. The air crash hazard can be minimized by preventing high occupancy uses, critical facilities, explosives or flammable materials, and tall structures from encroaching into the aircraft maneuvering areas and by insuring that air traffic does not become congested to the degree that the present low risk of a plane crash is increased.

The two airports in the County are Buchanan Field Airport, a County owned facility in the Concord-Pacheco area, and Antioch Airport, a privately owned public airport near the intersection of Lone Tree Way and Empire Road. There is no current plan to construct another airport in the County, although Buchanan Field air traffic is expected to reach its capacity in the next ten years.



Concord Naval Weapons Station

2-Mile Radius Safety Buffer Zone

Small Docks in Recreational Waters

Airport

Petroleum & Chemical Industries

Map 7a
Hazardous Land Uses

Source: CCCPD, 1975

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CARQUINEZ STRAITS

SUISUN BAY

SACRAMENTO RIVER

SAN JOAQUIN RIVER

SAN PABLO BAY

SAN FRANCISCO BAY

Crockett

Port Costa

Rodeo

HERCULES

PINOLE

MARTINEZ

West Pittsburg

PITTSBURG

ANTIOCH

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Kensington

WALNUT CREEK

LAFAYETTE

Orinda

Mt Diablo

Alamo

Diablo

Danville

San Ramon

Canyon

Moraga

Petroleum Product Pipelines

Natural Gas Pipelines

Oil and Gas Wells

Map 7b
Hazardous Land Uses

Source: CCCPD, 1975

Safety Programs

Chapter 86-2 of the County Zoning Ordinance establishes the Precise Airport Plan for Contra Costa County. The plan identifies sites in the County suitable for various classes of airports from general aviation facilities to helistops. The remaining unincorporated County is excluded from airport uses.

The Airport Land Use Commission, established by the State in 1968, has as its major task the development of a comprehensive land use plan around each public airport in the County including compatible uses, building height restrictions, construction standards and noise attenuation. To date the Commission has adopted planning areas defined as a three mile radius from the center of each airport and structural height limit plans within those areas.

Buchanan Field maintains fire fighting equipment and trained personnel for fire fighting and rescue operations. The airport has a Mutual Aid Agreement with the Contra Costa Consolidated Fire District for mutual assistance. At some future time the District plans to construct a fire station adjacent to the airport with doors opening on both sides to provide for rapid response on or off the airport.

Concord Naval Weapons Station

The Concord Naval Weapons Station occupies approximately 11,200 acres of north central Contra Costa in two locations. The tidal 5,900 acre site is the shipping point for munitions for all ships in the Pacific. The inland 5,300 acre site holds a 90-day supply of munitions, residences, administrative offices, and testing and research facilities. It is Navy policy to neither confirm nor deny the presence of nuclear weapons.

The area most hazardous to public safety is the shipping facility on Suisun Bay. A two mile radius safety buffer zone around the docks has been established as the maximum potential limit for structural damage, other than shattered glass, in the case of an extreme event such as an entire ship exploding.

Safety Programs

Although the explosion hazard is ever-present, the risk of an event which would affect public safety is low. The storage magazine system on the inland property is designed by spacing and construction to prevent an explosion

which would create an emergency outside the Navy property. Advanced types of electronic surveillance equipment as well as manned patrols constantly observe the property boundaries. Precise safety procedures minimize the risk to the public from an explosion at the docks. Ships do not move into the shipping channel during heavy fog or at night, and outbound ships are accompanied by a pilot and a Coast Guard escort.

The station is equipped with fire equipment and crews, ambulances, a medical facility with doctors and nurses, emergency water monitoring and treatment units, and ordinance disposal teams. The Navy Disaster Control Plan calls for all of these to be available to the community in an emergency as coordinated through the Office of Emergency Services. By agreement, fire crews respond on a standby basis when fires occur on nearby industrial properties. Ordinance disposal teams assist local law enforcement agencies in responding to suspected bomb incidents and perform bomb disposal. Naval personnel and equipment would be available to the community in any natural disaster, but would not be available in case of enemy attack or civil disturbance, except that Marines may be assigned solely to protect property during a civil disturbance.

Industry

The heavy industry centered on the west and north shores of the County has the potential for significant risk to public safety because of the hazardous nature of petroleum and chemical materials. Besides the explosion and fire potential of petroleum products, many toxic substances are employed in industry which are lethal in very low concentrations in gaseous form. Toxic and hazardous substances are concentrated in heavy industries along the coasts, and are also present in lesser but unknown quantities in industrial parks in the interior County. Despite industrial safety procedures, their presence in large quantities in the County, particularly close to and/or upwind of populated areas is a potential safety hazard at all times.

Many industries are located on reclaimed marshland underlain by soft, wet, unstable muds. Damages from earth movements are believed to have a low probability of risk because of the foundation design of buildings and other facilities to support the weight of the structures. Information is not available on whether or not there are older tanks not sufficiently stabilized. Informal observation of tanks in the County indicates that there is no requirement to space tanks far enough apart to prevent a fire or explosion from spreading. In areas in which tanks are closely spaced, particularly where these are close to population centers, there is a potential for a disaster affecting a significant population. This risk is believed to be very low,

based on the fact that such an incident has not occureed in forty years or more, but the seriousness of the event, should it occur, indicates that some additional measure of public safety may be advisable.

Safety Programs

Industrial safety features are primarily designed to prevent an emergency spill, fire, or explosion from occurring. Tank inspection by the State Department of Industrial Safety prior to certification for use, construction to the standards of the Association of American Petroleum Industries and the American Society of Mechanical Engineers, and the installation of water and foam lines adjacent to tanks, plus mobile fire equipped and trained employees, together provide a high standard of industrial safety.

Land Use Hazards to Navigation

With over 70 square miles of water area and hundreds of miles of shoreline along the bays, rivers and sloughs, off-shore waters are particularly important in Contra Costa for industrial, commercial, agricultural and recreation uses. The public right to use open water for navigation is established in the state constitution and state law, but navigation can be hazardous if land-based activities result in obstructions such as docks, low bridges, or elevated pipe lines. Where waters are shallow for some distance from shore commercial and industrial docks are usually built out to the shipping channel as a more acceptable plan than continuously dredging a side channel closer to shore. The Corps of Engineers permit system prevents docks from encroaching into shipping channels. Small docks for commercial or private recreational use having proliferated around Bethel Island and on the mainland side of Sand Mound Slough. The U.S. Department of the Interior, noting "a plethora of uses not associated with commerce activities," on the State's waterways indicates that controls are necessary to protect the public right to use navigable waters. It should also be recognized that because thousands of boaters use the Delta annually, many of them not skilled, the proliferation of smaller docks may be a hazard to public safety. The risk would not be of the nature of a disastrous single event, but is rather a persistent hazard which would probably affect only a few persons at a time.

Safety Programs

The dock permit system, which includes application review by a multiplicity of agencies prior to approval by the Corps of Engineers insures that each individual dock will be well designed and constructed. Yet this is not a program

which speaks to the issue of a potential hazard to public safety from hundreds of such docks closely spaced. The Delta Advisory Planning Council, composed of representatives of the five Delta Counties, is considering the problem but to date has not taken a specific position. Its preliminary plan, however, notes a need to protect public safety in the use of waterways for recreation and identifies the responsibility of local government to plan and regulate for public safety. This view is supported by the Delta Water Recreation Task Force in its 1973 Delta Master Recreation Plan.

TRANSPORTATION OF HAZARDOUS SUBSTANCES

Fuel Piplines

Hundreds of miles of pipelines for the transportation of natural gas, crude oil, and refined petroleum products traverse the County. These are not confined to an industrial district but pass through population centers. Pipes are up to 36 inches in diameter. Natural gas is believed to be less hazardous to the public than petroleum products because it is transported at lower pressures and when released, rises and dissipates into the atmosphere. Petroleum products are pumped at pressures up to 200 psi (pounds per square inch) and when released, flow along the ground. Petroleum fires are more likely to spread to nearby property than vertical-burning natural gas fires.

Pipelines cross varied terrain in the County. Many cross areas which pose geologic hazards, including active fault lines, landslide deposits, unstable slopes, and areas underlain by soft muds and peat. Geologic hazards from land movement exist to an unknown degree. The public safety hazard from a pipeline break depends on the proximity of the event to populated areas more than on the location of geologic hazards to the pipelines themselves.

Safety Programs

The petroleum industries and P G & E are fully aware of the public safety hazard from fuel pipelines and have cooperated with each other and with public agencies to continually upgrade construction and safety equipment. Pipelines constructed since 1965 are constructed to more stringent industry standards than installations ten or more years old. Connections and anchorages of older lines have been improved in some cases. Modernization also includes automatic shut-off valves, flexible materials, and pressure monitering. The Bay Area Pipeline Association has approved the State Office of Emergency Services (OES) Hazardous Materials Plan and the County OES support plan 22, dealing with oil spills. Mutual aid agreements exist between pipeline owners and the fire districts.

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SAN PABLO BAY

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EL CERRITO
Kensington
PLEASANT HILL
CONCORD
West Pittsburg
PITTSBURG
ANTIOCH
Oakley
Knightsen
BRENTWOOD
CLAYTON
WALNUT CREEK
LAFAYETTE
Orinda
Canyon
Moraga
Mt Diablo
Alamo
Diablo
Danville
San Ramon
Byron

Concord Naval Weapons Station

Approved Explosives Routes

Railroads

Safe Stopping Place

Inspection Stop

Map 8

Transportation Routes for Hazardous Substances

Source: California Highway Patrol, 1975

Oil and Gas Wells

Approximately 130 producing gas and oil wells are located in the County. Most are located at some distance from populated areas. Although there is an everpresent hazard of a well catching on fire, such incidences have been very few in number and the risk of such a fire causing a general disaster is remote. North and east of Brentwood continual parcel splits, resulting in a dispersed but sizeable population, could lead to a public safety hazard if rural residential areas are permitted to encroach into the oil producing area. Because of the significant fire hazard in peat soils, a concentrated population plus numerous wells in peat soil areas could expose persons and properties to the hazard of peat fires which are difficult to control and may smoulder for weeks or months before they are completely extinguished.

Safety Programs

The industrial safety programs of the owners provide an acceptably low risk to the public, assuming that future development or other hazardous uses do not encroach close enough to create a hazard to well safety or to be subject to a risk of well fire damages.

Explosives

Explosives are defined in the California Health and Safety Code, Section 25651, as any substance or combination of substances the primary purpose of which is detonation or rapid combustion. Therefore most munitions and some chemical materials are included in the Class A explosives category regulated by the State and various bridge authorities. There are numerous users of explosive materials in the County, but by far the largest is the Concord Naval Weapons Station (CNWS). Munitions are regularly transported by truck, train and ship. Other explosives used for construction and quarrying are present in smaller amounts throughout the County.

Two railroad companies serve Contra Costa County; Santa Fe and Southern Pacific. Both transport munitions for CNWS. Truck transportation of explosives through populated areas constitutes a significant public safety hazard. Permitted routes designated by the California Highway Patrol include the major freeways and other highways in the County. Drivers are competent in operating the vehicles, but they may be uninformed in the proper handling of the cargoes under emergency situations. The records of the Office of Emergency Services show numerous emergency incidents in the last several years on Contra Costa's highways.

Safety Programs

Explosives in transit are regulated by the U.S. Department of Transportation which sets national safety guidelines. These are incorporated into the California Vehicle Code and Health and Safety Code. Regulations are applied to labeling, packaging, and loading of explosives, safety equipment on trucks and placarding for public information. Permits are granted to trucking companies and may be revoked if spot checks by the California Highway Patrol (CHP) reveal an excess of violations. Bridge permits are granted for explosives and corrosive shipments based on standards of the various bridge authorities. Rail transport is not regulated but is normally maintained to the standards of the U.S. Department of Transportation for special car design and safety procedures for loading and switching. Although not required by any regulations, the railroad companies have initiated the practice of placing munitions cars on nonstop trains through populated areas. This policy has been rigidly adhered to since the 1973 Roseville disaster when a train blew up in town, and a more recent emergency in Brentwood.

Explosives and corrosives may only be transported on routes established by the CHP, which issues citations for route and other violations. The limits of CHP manpower do not permit a high level of enforcement or more than random spot checks; nevertheless numerous citations are issued.

Petroleum and Chemical Products

Extremely hazardous and toxic substances routinely pass through the County every day. The nature and degree of the specific hazard associated with each substance is not precisely known to any agency. Since over 1,200 new hazardous chemicals are marketed each year, the magnitude of acting on them would be immense. Regulations are less restrictive than for explosives. No particular routes are designated, but most of these materials are regularly transported on the freeways and major roads designated as explosives routes. Thus, the problems of an uncontrolled environment and proximity to a large public add to the risk of an accident becoming a disaster. Many exotic chemicals require highly specialized knowledge and equipment for their control. Some are lethal at atmospheric levels as low as two parts per million. Local agencies such as the police and fire departments are not informed on appropriate methods of managing these substances and thus could worsen emergency conditions by their efforts to control a situation.

Safety Programs

Liquified petroleum gas is regulated by the California Division of Industrial Safety. Flammable liquids are regulated by the State Fire Marshall through Division 14.7 of the California Vehicle Code. All other hazardous materials are regulated by the CHP in accordance with the California Administrator's Code, Title 18, Article 1.5. Bridges have individual requirements for the passage of corrosive and flammable substances. These regulations pertain to labeling, packaging, and loading of cargoes, and to vehicle type and safety equipment. Cargoes are not allowed to be mixtures of incompatible commodities. The U.S. Department of Transportation (DOT) requires drivers to be provided with detailed written information on how to deal with the specific hazardous cargo they are transporting in the event of an emergency. The DOT attempts to design emergency safety regulations for varying types of hazards, but cannot keep up with the proliferation of new chemicals. Trucks are not required to be placarded for public information, though many are as a public safety measure.

Radioactive Materials

More elusive hazards in daily transit throughout Contra Costa County are the various forms and quantities of radioactive materials transported in unmarked cars and trucks. In the event of an accident small radioactive sources can be dislodged from their protective containers and become extremely difficult to locate. The danger is not always immediately recognized, and alleviating the situation requires special knowledge and equipment. Persons may be unknowingly subjected to radiation in traffic accidents, home fires, and other day-to-day happenings. Radioactive contamination is not a threat to life in smaller doses, but irreversible damage can occur and the long-range effects from exposure can be serious. Decontamination of affected property is also difficult. Although not considered capable of causing a general disaster at this time, the widespread virtually uncontrolled presence of radioactive materials in today's society is of a nature and degree to be considered a persistent hazard to public safety.

Safety Programs

The Bureau of Radiological Health of the California Department of Public Health regulates the transportation of radioactive materials. The CHP is permitted regulatory powers in Section 25651 of the California Health and Safety Code, but has not exercised this power.

The State Department of Public Health grants permits to use radioactive materials but does not have the funds or manpower to review the permits or evaluate the safety of the conditions under which they are handled. Copies of the permits are filed at the County Department of Health, Office of Emergency Services and the appropriate fire district. As of April, 1975, sixty-two permits are granted in Contra Costa County. Two hundred detection kits, provided by Federal funds for Civil Defense are distributed to fire districts and other appropriate agencies. Most firemen are trained in the use of the equipment.

The OES has arranged a 24-hour emergency coordinating service for all users of radioactive materials. All accidents known to involve radioactive materials are reported to the State Department of Public Health and appropriate emergency agencies.

LAND USE AND TRANSPORTATION HAZARDS AND PLANNING PROCESSES

The County has the responsibility for determining land uses and the configuration of community development within its jurisdiction, but does not determine the nature of substances used on industrial and military sites. Nor does the County grant permits for the use or transportation of hazardous substances, determine appropriate routes for transporting these materials, or require properly informed emergency personnel. Public safety from the use and transportation of hazardous substances depends on actions by the state and federal governments.

In the case of hazardous land uses, the County Planning Agency can minimize public safety risks by ensuring that hazardous use areas and residential populations are separated to the extent that fire or explosions on industrial and military properties or in gas and oil well areas will not spread to homes or businesses. Future air traffic congestion at the Buchanan Field airport could be relieved by the construction of a touch-and-go landing strip in another location identified as suitable for that use.

Prevention of hazardous materials being released into the air or water depends primarily on industrial safety requirements and procedures. By requiring that project proposals to construct tanks, pipelines, and other facilities are accompanied by thorough investigations of the natural and man-made hazards which could affect the proper functioning of these facilities, the County can be assured that risks are reduced to the minimum which can be achieved by engineering technology.

State and federal regulations and permit procedures for the transportation of hazardous substances may be adequate for cross-country shipments, but the

seriousness of the risk of a disaster from these materials passing through population centers, and being mixed with ordinary traffic in the uncontrolled environment of freeways and other highways, indicates that a more severe regulatory program is needed to protect public safety. Regulations are not directly focused on the greater public safety hazard in populated areas and enforcement is not adequate because of the lack of funds and manpower. The multiplicity of regulatory agencies and standards also inhibits a coordinated effort to view the entire subject of the transportation of hazardous materials from the point of view of affected communities.

Since emergency and disaster plans and procedures have been prepared by the County Office of Emergency Services, it is appropriate for all potentially disastrous events to be reported to the OES, so that County emergency services such as traffic control, fire and medical equipment, and evacuation notification can be available if needed.

Controls over the use and transportation of radioactive materials in the County are inadequate. As with other hazardous substances, the County has virtually no control over the distribution and transportation of radioactive materials. Land use controls would not add to public safety as long as materials on the site are handled safely, but risks associated with the transportation of these materials could be reduced by requiring all vehicles to be placarded, and by requiring all accidents involving such vehicles to be reported to the County OES.

POLICIES FOR LAND USE AND TRANSPORTATION HAZARDS

1. The County should consider providing a landing strip for touch-and-go traffic prior to the time Buchanan Field suffers from air traffic congestion.

2. The County should revise the ordinance code to require the issuance of land use permits for all industrial uses.

3. Industries which store and process hazardous materials should provide a buffer zone between the installation and the property boundaries sufficient to protect public safety.

4. To the greatest possible extent new fuel pipelines should not be routed through centers of population nor should they cross major disaster evacuation routes.

5. In order to provide for public safety, urban and suburban development should not take place in areas where they would be subject to safety hazards from oil and gas wells.

6. The State Department of Health and California Highway Patrol should be encouraged to review permits for radioactive materials on a regular basis and should promulgate and enforce public safety standards for the use of these materials, including the placarding of transport vehicles.

7. State and federal agencies with responsibilities for regulating the transportation of hazardous materials should be requested to review regulations and procedures, in cooperation with the County to determine means of mitigating the public safety hazard in urbanized areas.

8. When an emergency occurs in the transportation of hazardous materials, the County Office of Emergency Services should be notified as soon as possible.

9. Industry should be encouraged to utilize underground pipelines, rail, and water transportation of hazardous materials to the greatest extent feasible to take advantage of the greater separation from the general public provided by these modes of transportation.

10. Applications for private or commercial recreation docks which would encroach into waterways used primarily for recreation boating should be reviewed by the County to evaluate their aggregate impact upon public safety.

WATER SUPPLY SAFETY

GOAL: To insure a continuous supply of safe water to County residents.

FINDINGS

All residents in the County are dependent on a continuing supply of water. Water needs increase during a disaster, with extra amounts required for fire fighting, sanitation, and cleaning up debris. Damages to this essential supply can occur in the centralized parts of water supply systems--the intakes, canals, and major reservoirs--or can occur at the delivery points as a result of disruption of main lines or of the many subsidiary lines to each home, school, business, or hospital. The former case could affect thousands of persons, but can be repaired relatively quickly. Loss of water in localized areas would affect fewer people, but because repair times could be longer, hazards to property and safety could be greater for inhabitants of such areas. In a general or widespread disaster the water supply to several parts of the County could be disrupted for days or weeks. Although the risk of such an event is believed to be low, the seriousness of the impact on affected communities indicates that citizens, water suppliers and government agencies should be prepared to supplement water supplies for disaster recovery uses.

WATER SUPPLY AGENCIES

The two large municipal water districts in the County are the East Bay Municipal Utility District and the Contra Costa County Water District. These districts are shown on Map 9 along with two smaller outlying service areas which utilize local well water.

East Bay Municipal Utility District

The East Bay Municipal Utility District (EBMUD) supplies treated water to parts of Pleasant Hill, Walnut Creek, the San Ramon Valley, the Lafayette-Moraga-Orinda urbanized area, and the west coast communities. Western Alameda County is also in the district. Water is brought into the District through the Mokelumne Aqueducts which cross north and central Contra Costa County, ending near Walnut Creek. From there it is conveyed to Lafayette, San Leandro, Briones, and San Pablo Reservoirs through tunnels and trunk lines. The District's raw water terminal reservoirs hold at least an 87-day water supply of approximately 50 billion gallons. Treated water distribution reservoirs located throughout the District have the equivalent of two maximum use days (Max Day) capacity. This amounts to a total of

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1" = 8,000'

CARQUINEZ STRAITS

SUISUN BAY

SAN PABLO BAY

SACRAMENTO RIVER

SAN JOAQUIN RIVER

SAN FRANCISCO BAY

Crockett

Port Costa

Rodeo

HERCULES

PINOLE

MARTINEZ

West Pittsburg

PITTSBURG

ANTIOCH

Oakley

Knightsen

BRENTWOOD

Brentwood Water Dept.

Discovery Bay Water Dist.

Byron

El Sobrante

SAN PABLO

RICHMOND

East Bay Municipal Utilities Dist.

EL CERRITO

Kensington

Pacheco

CONCORD

Contra Costa County Water Dist.

PLEASANT HILL

CLAYTON

WALNUT CREEK

LAFAYETTE

Orinda

Mt Diablo

Alamo

Diablo

Danville

San Ramon

Canyon

Moraga

Water Districts

Mokelumne Aqueduct, EBMUD

Contra Costa, Clayton & Ygnacio Canals, CCCWD

Mallard Slough & Rock Slough Intakes, CCCWD

Residential Areas on Wells & Septic Systems

Reservoir, Capacity over 1,000,000 Gal.

Major Open Reservoirs

Map 9

Water Services & Facilities

Source: CCCPD, 1975

over 0.8 billion gallons of treated water above the average daily use of 210 million gallons. In a disaster, cut backs in industrial use and refraining from garden watering would extend the number of days of emergency capacity.

In case of a breakdown in the supply from the Mokelumne Aqueducts at least 87-days of terminal storage would be available for repairs, based on reservoir reserves. In case of a breakdown in the system which delivers treated water from the terminal reservoirs to users, the District has emergency capability to pump from one pressure zone to another.

Contamination of the large reservoirs is considered a very low risk since large quantities of costly materials would be required to damage these large bodies of water. Biological and many chemical substances are inactivated by chlorine, and thus would be removed in the treatment plants prior to reaching users. Contamination in distribution reservoirs after treatment can be removed by the mobile chlorination units maintained by the District. If required, water can be pumped in from a nearby uncontaminated reservoir.

Contra Costa County Water District

The Contra Costa County Water District (CCCWD) supplies treated and untreated water service to approximately 112,000 acres in central and eastern County. The Treated Water Division includes the Cities of Concord and Clayton, portions of Walnut Creek, Pleasant Hill and Martinez, and the communities of Port Costa and Clyde. The CCCWD Water Supply Division wholesales raw water to industries and to cities and water services within the CCCWD for treatment and distribution to domestic customers, and operates the Contra Costa Canal system. Major municipal customers include Oakley County Water District, City of Antioch, City of Pittsburg, Bay Water Service (West Pittsburg), City of Pleasant Hill (Gregory Gardens area), City of Martinez, and the Treated Water Division. Two small neighborhoods in the Mt. Diablo area also divert and treat canal water. Water sold to the Treated Water Division leaves the canal system in the vicinity of the Bollman Water Treatment Plant near Clyde. Major industrial customers and the City of Martinez receive raw water from this point via the Short-cut Pipeline ending at the Martinez Reservoir. The Treated Water Division and City of Antioch also divert water directly from the Sacramento or San Joaquin Rivers.

Raw water from the Rock Slough intake in the Delta is conveyed across the north and central county in the 48-mile long Contra Costa Canal system. Canal water is sold to industries, domestic water services, and is used for irrigation. Raw water storage includes: 1778 acre feet in the Contra Loma

Reservoir for emergency use in case of pumping power failure, the contents of the canal system, and 265 acre feet of storage in the Martinez Reservoir. A recent study for the District recommends two additional reservoirs, one each in the central and east county areas, to provide the capacity to "blend out" saline water in case of a major emergency such as the Andrus Island levee break of 1972. The total recommended storage capacity is 7,000 acre feet. The Andrus Island levee break was an event close to the calculated "worst possible event". The break, and consequent deep intrusion of saline water into the Rock Slough intake, occurred in June. Fresh water flows into the Delta were at a level of from 6,000 to 8,000 cubic feet per second (cfs). If a major levee break on a large island occurred later in the season, when fresh water flows may be as low as 3,000 to 4,000 cfs, the duration of damage to Contra Costa water quality would be much greater.

Additional diversions of Delta Waters could severely impact the quality of CCCWD intake waters and lead to the depletion of storage. Severe adverse effects could be experienced by irrigation users, industry, and purchasers of raw water for treatment and domestic consumption. The CCCWD is concerned that policies and projects for export of Delta water will have serious adverse impacts on the quality of water available to the District.

Like open reservoirs, the Contra Costa Canal is subject to damage from contamination, structural failure and landslides. The risk of contamination, whether by chance or intent, is believed to be very low because the volume of material required to contaminate to a hazardous level would be bulky and costly. The canal is monitored regularly for structural defects and water quality. A recent investigation of the canal in the vicinity of the Concord fault revealed no evidence of damage to the canal. Should a major earthquake result in a lateral off-set of as much as two to three feet in the canal, 50 percent of the flow could still pass. The greatest hazard to the canal is posed by landslides. The risk is greater during the rainy season and where the canal lies adjacent to high steep cuts through inherently unstable material. In thirty years of canal operations there has not been a case of major slide damage, but there have been three or four minor slides in the vicinity of Martinez and in the Lime Ridge area. The canal from Clyde to Martinez is now used only as a back-up for the Martinez service in case of failure of the short-cut pipeline. Maintenance and repairs are conducted as needed and during the annual one week shut down of the western canal system. During this period the Pleasant Hill service uses its permanent inter-tie with the CCCWD Treated Water Division.

Other Water Services

Domestic water services which buy raw water from CCCWD have varying storage capabilities for treated water. Reservoirs in all cases contain the excess capacity for fire fighting as required by Fire Districts. Overall excess storage for emergency use varies from approximately one peak summer day, the equivalent of less than two average use days, to virtually no emergency storage of treated water.

Wells

The greatest risk to well water safety is contamination by sewage effluent from nearby septic systems. This is most likely to occur where both wells and septic systems are closely located in an area, where impervious soil conditions lead to standing water on the land during the rain season, and where wells are shallow. Deep wells are relatively less susceptible to surface contamination.

Much of the County west of the Delta has limited ground water resources. Valleys typically have shallow low yield aquifers underlain by impervious nonwater-bearing rock. The yield is not adequate for irrigated crops, and may not be able to supply a large number of wells for dometic uses. Detailed investigations have not been made to determine maximum non-depleting yields. Although a number of wells have run dry after an exceptionally dry winter, no area is at present known to be developed to its maximum safe level. Saline intrusion into north coast aquifers as a result of large withdrawals for industrial and agricultural use is gradually being corrected since these aquifers are now very little used, but their previous depletion is an indicator of limited developability. All the open hills and valleys, and particularly stream channels, aid in the replenishing of aquifers. Areas which are planned for residential development on wells require considerable open space around them to insure that limited underground supplies are replenished each rainy season. At some future time these areas may be required to construct check dams and ponds on local creeks to allow surface runoff to percolate into the ground.

Water Safety Programs

Emergency preparedness and excess storage capacity vary considerably among the water services. Districts and city services which participate in the Emergency Services Program and which have emergency plans approved by the State Office of Emergency Services are required to have contingency plans

for emergency supplies, including storage, auxiliary power where appropriate, and agreements to utilize local tanker trucks of Fire Districts, Public Works Departments and private companies. The County Office of Emergency Services (OES) has agreements with participating cities and districts to provide emergency potable water and fire fighting water. Other jurisdictions would also receive these services on a priority basis. Tankers include over thirty provided by the OES to Fire Districts and tankers belonging to public agencies. Private company tankers, such as those of C & H Sugar Company and construction companies, which have not been used for contaminating substances may also be utilized in a County disaster declared by County officials. Additionally, the OES has over 10,000 filled 17.5 gallon water drums and several thousand empty drums which can be transported on flat bed trucks to areas where drinking water is needed. Hospital and convalescent hospital plans include means of securing and utilizing emergency water supplies.

Auxiliary generators are available to cities and districts participating in the State Emergency Services Program through the OES at very low cost. Auxiliary power is particularly important to water services which do not have elevated reservoirs for gravity flow, but must rely on pumps to keep water moving through the system.

The County Health Department tests certain unused private wells each year for potable quality. The pumping requirements for each well are known so that OES and the Department of Health can provide generators and bring these wells into operation if needed in an emergency or disaster. There is at present no plan to determine if or how other underground water supplies could be used in emergencies. The location of wells presently in use is largely on the periphery of urban areas and could be important in providing for a temporarily displaced population. Many old wells exist within the major water districts. These have been capped and would be difficult to put back into operation quickly, as would be required in an emergency and their combined flow would not provide more than a small fraction of disaster needs.

On December 17, 1974, the National Safe Drinking Water Act was enacted. The Act requires the Environmental Protection Agency to establish drinking water maximum contaminant levels and test water supplies throughout the country. No water suppliers in Contra Costa anticipate adverse findings in the EPA tests. The Act also provides for a survey of the quantity, quality, and availability of rural water supplies, but EPA has no plan to proceed with this program at the present time.

The Contra Costa County Ordinance Code, Section 8463(i) specifies that storm waters flowing from any subdivision development shall not be permitted to flow into any water conveyance or impounding facility for domestic water consumption. This provision protects the Contra Costa Canal and the several large open reservoirs of CCCWD and EBMUD from contamination from nearby development.

Portable water treatment plants are available through the Army, Navy and County Office of Emergency Services. These would be available in a disaster to treat temporary water supplies from swimming pools, wells, or tanker trucks. Tankers can be used from fire districts or any source which has not used its tanker trucks for toxic or hazardous materials. Hospitals and mass care centers would have first priority for trucked-in water and other sources of temporarily treated water.

The County Department of Health, and in one case the State Water Resources Agency, Regional Water Quality Control Board, have put moratoria on septic permits in areas which have exceeded the capacity of the ground to absorb sewage effluents. On several occasions the County Health Department has sent information sheets on well decontamination methods to property owners in areas where there is a high risk of domestic water contamination from sewage effluents.

WATER SUPPLY SAFETY AND PLANNING FUNCTIONS

The plans and elaborate equipment kept in readiness by water services to reduce the risk of water shortages during an emergency or general disaster may be costly but are not extreme in view of the absolute public reliance on a water supply for drinking, sanitation and fire fighting during a disaster recovery period.

All water services in the County should be encouraged to establish plans and procedures for a continuous domestic and fire fighting supply in case of a power failure or other emergency with more than local impacts. Methods include agreements with owners of tanker trucks, information to home owners on the conservation and use of the approximate fifty gallons of water stored inside homes in toilet tanks, pipes, and water heaters, elevated storage of treated water and/or auxiliary power in case of a power failure, and permanent interties between adjacent services for emergency supplies such as exists between the Gregory Gardens area service in Pleasant Hill and the CCCWD Treated Water Division.

Although it is not now considered practicable to plan for the use of well water as an emergency supply, ground water can not be lost suddenly and is not easily contaminated. In case of a great and widespread disaster ground water supplies could be the safest and most readily available source of water for a large population. Although the risk of such an event is believed to be very low, it would be wise to locate and evaluate wells in various parts of the County and develop procedures to bring them into use if needed.

The public health risk from well contamination in areas undergoing residential development without the benefits of either treated water or sewage service can become unacceptable in localized areas. In areas planned for continued development, the aggregate impact of wells and septic systems is a public safety concern and is an appropriate consideration in land use and resource planning. Septic system permits issued by the County Department of Health are based on the capabilities of each individual lot. Consideration of the overall impact of numerous wells and septic systems in a poorly drained area is primarily the responsibility of the Planning Agency. A useful tool in making this determination is the Contra Costa County Soil Survey, prepared by the Soil Conservation Service in 1974, which includes for each soil type several factors related to possible well-septic problems, including slope, surface drainage, water infiltration rates, the tendency to surface ponding, and a high seasonal water table.

It is difficult to define a suitable type and degree of development in areas which must rely on wells for domestic consumption, garden irrigation, and stock watering because so little is known about the characteristics of individual aquifers. Without guidelines on the potential developability of underground water resources, it is difficult to provide a margin of safety to the users. The State Resources Agency, Division of Mines and Geology, has the capability of undertaking a study of aquifer resources, and can be requested by the County to make such a study for areas proposed to undergo major development on wells.

POLICIES FOR WATER SUPPLY SAFETY

1. All water services should be encouraged in their efforts to provide water supply safety for emergency and disaster uses by the most practicable means.

2. The County should encourage domestic water services to participate in the State Emergency Services Program for Countywide coordination

of emergency response planning and to take advantage of low cost purchase of auxiliary power equipment where these programs would result in greater security for domestic water supplies.

3. Domestic water suppliers should be encouraged to undertake programs to inform homeowners, schools, convalescent hospitals, and other institutions to appropriate and efficient emergency use of available water in an immediate post-disaster recovery period.

4. The use of wells for emergency water supplies should be considered in the emergency preparedness plan of domestic water suppliers.

5. Annexation of small neighborhood service areas into the larger districts should be supported when such annexations would result in water supply safety benefits to the consumers.

6. Land use plans and major project proposals that would encourage development on wells and septic systems should be approved only after there are assurances of the adequacy of the aquifer and a minimum risk of well contamination during the rainy season.

7. Because of the public need for water of a quality suitable for domestic, industrial and agricultural uses, the County should evaluate and review Regional, State and Federal programs which could affect water quality and water supply safety in Contra Costa County.

PUBLIC PROTECTION SERVICES AND DISASTER PLANNING

GOAL: To provide for a continuing high level of public protection services and coordination of services in a disaster.

FINDINGS

Public protection services for fire, police and medical emergencies are essential to the community in day-to-day emergencies and would provide the major work force, facilities and equipment for disaster recovery. These services are provided by a variety of agencies and levels of government so that a high degree of communication and coordination of activities is required to prepare for potential disaster conditions. Because of the community development pattern and concentrated major transportation routes through communities, evacuation and the free movement of emergency vehicles could be severely impeded in a disaster because of general traffic congestion in certain areas or because of the collapse of one or more key freeway overpasses.

This section includes a discussion of fire hazards, fire services and fire prevention, police services and the crime prevention aspects of project design, and medical facilities for disaster recovery. The Contra Costa County Office of Emergency Services (OES) prepares disaster plans for the County and coordinates required emergency services and facilities from all agencies and levels of government to meet emergency and disaster needs.

FIRE HAZARDS AND FIRE SERVICES

Fires may occur in the various structures used for industry, commerce, homes, and public gatherings and may also occur as wildfire in open unirrigated areas. Fire prevention techniques differ for structural fires and wildfires, but successful fire control and extinguishment in either case depends on getting fire fighters and equipment on the scene promptly.

Wildfire

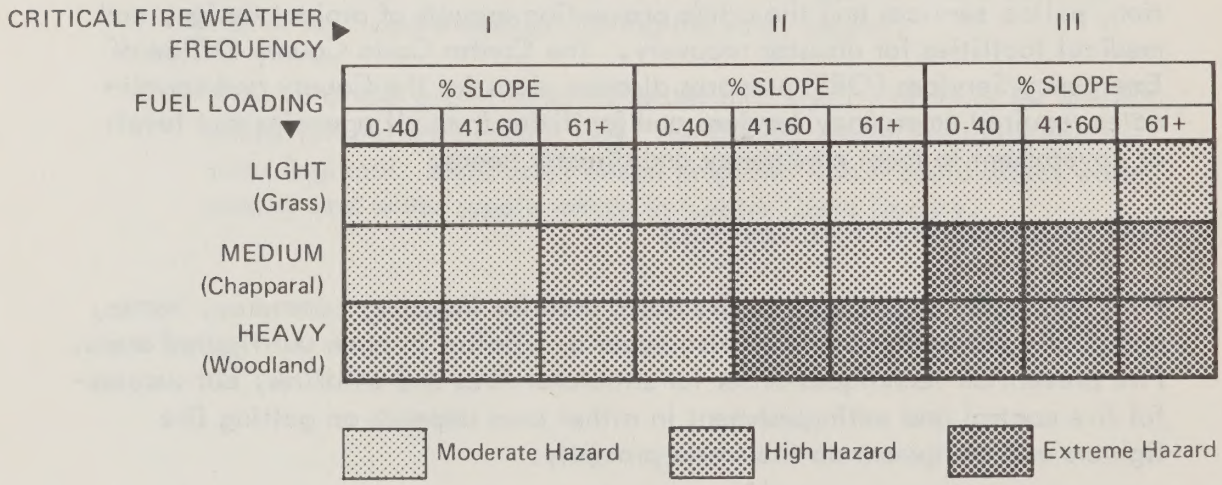
Because the natural vegetation and dry-farmed grain areas in the County are extremely flammable during the late summer and fall, wildfire is a serious hazard in undeveloped areas and on large-lot homesites with extensive areas of unirrigated vegetation. In addition to the dry season several other factors affect the relative degree of wildfire hazard. These include:

Atmospheric Humidity
Slope Steepness

Vegetation type
Exposure to Solar Radiation
Wind Speed and Direction
Accessibility to Human Activities
Accessibility to Fire Fighting Equipment

Atmospheric humidity is normally higher in the West County in the path of the moist Pacific air flow, and becomes progressively less as one moves east. This characteristic is the basis for wildfire hazard areas established by the California Fire Weather Frequency, shown in the chart below. Class I has 0 to 1 days per year of Critical Fire Weather, Class II has 1 to 9.5 days, and Class III has over 9.5 days. Steeper slopes are a contributing factor because they have a firespreading effect similar to higher velocity winds. Fuel loading, which reflects the differing amounts of fuel provided by various vegetation types, is also important in determing the degree of hazard.

FIRE HAZARD SEVERITY SCALE



Fire Hazard Severity can be further refined by including exposure to solar radiation since south and west facing slopes are generally dryer than north and east facing slopes, and thus have a somewhat longer fire hazard season. Wind speed is not predictable, but strong winds are generally more prevalend on prominent ridges so that ridge tops are particularly susceptible to the spread of fire.

More than ninty-nine percent of wildfires in Contra Costa are caused by people and their activities. Where there is easy access to dry vegetation there is a higher risk of fire. Such areas include outlying residential parcels, open lands adjacent to residential areas, and unirrigated parklands. Suppression of natural periodic fires in chaparral and woodlands over the last several decades, with the consequent build-up of fuel on the ground, increases the risk of a hot fire which is very difficult to control once such an area is ignited.

A hazard unique to the Delta is peat fire. Once ignited, peat soils may smolder for weeks or months and are extremely difficult to extinguish. In a few instances islands have been flooded in order to extinguish peat fires. any area lying east of the mean Sea Level line may be peaty due to the marsh origin of the soils, although local areas of mineral soil are present within the general area.

Preliminary wildfire hazard areas are shown on Map 10.

Structural Fire

Prevention and extinguishment of structural fires is essential to life and property safety. Although great progress has been made in fire prevention in recent decades, there are some areas of concern in which further improvements may be achieved without unreasonable public expenditures. Once a fire is ignited, the risk of damages may be increased by:

Lack of built-in fire detection and extinguishment features.

Lack of fire retardant materials on floors, or in attic spaces, or lack of full parapet common walls.

Lack of features to aid access of men and equipment in high-rise buildings.

Lack of early extinguishment features in large unpartitioned areas such as warehouses or commercial showrooms.

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1" = 8,000'

CARQUINEZ STRAITS
SUISUN BAY
SACRAMENTO RIVER
SAN JOAQUIN RIVER
SAN PABLO BAY
SAN FRANCISCO BAY

Crockett
Port Costa
Rodeo
HERCULES
MARTINEZ
PINOLE
El Sobrante
SAN PABLO
RICHMOND
EL CERRITO
Kensington
Pacheco
CONCORD
PLEASANT HILL
CLAYTON
WALNUT CREEK
LAFAYETTE
Orinda
Moraga
Canyon
Danville
Alamo
Diablo
Mt Diablo
San Ramon
West Pittsburg
PITTSBURG
ANTIOCH
Oakley
Knightsen
BRENTWOOD
Byron

I
II
III

Slopes of 30% and over

Peat Soil Area

Approximate Boundaries of Critical Fire Weather Classes

I less than 1 day per year
II 1 to 9.5 days per year
III 9.5 or more days per year

Map 10
Fire Hazard Areas

Source: Division of Forestry, 1973
USGS, 1970

Traffic congestion.

Difficulty in identifying location because of uncoordinated street name and house numbering systems, obscure house or apartment numbers, and in rapidly developing areas, lack of maps showing new streets and roads.

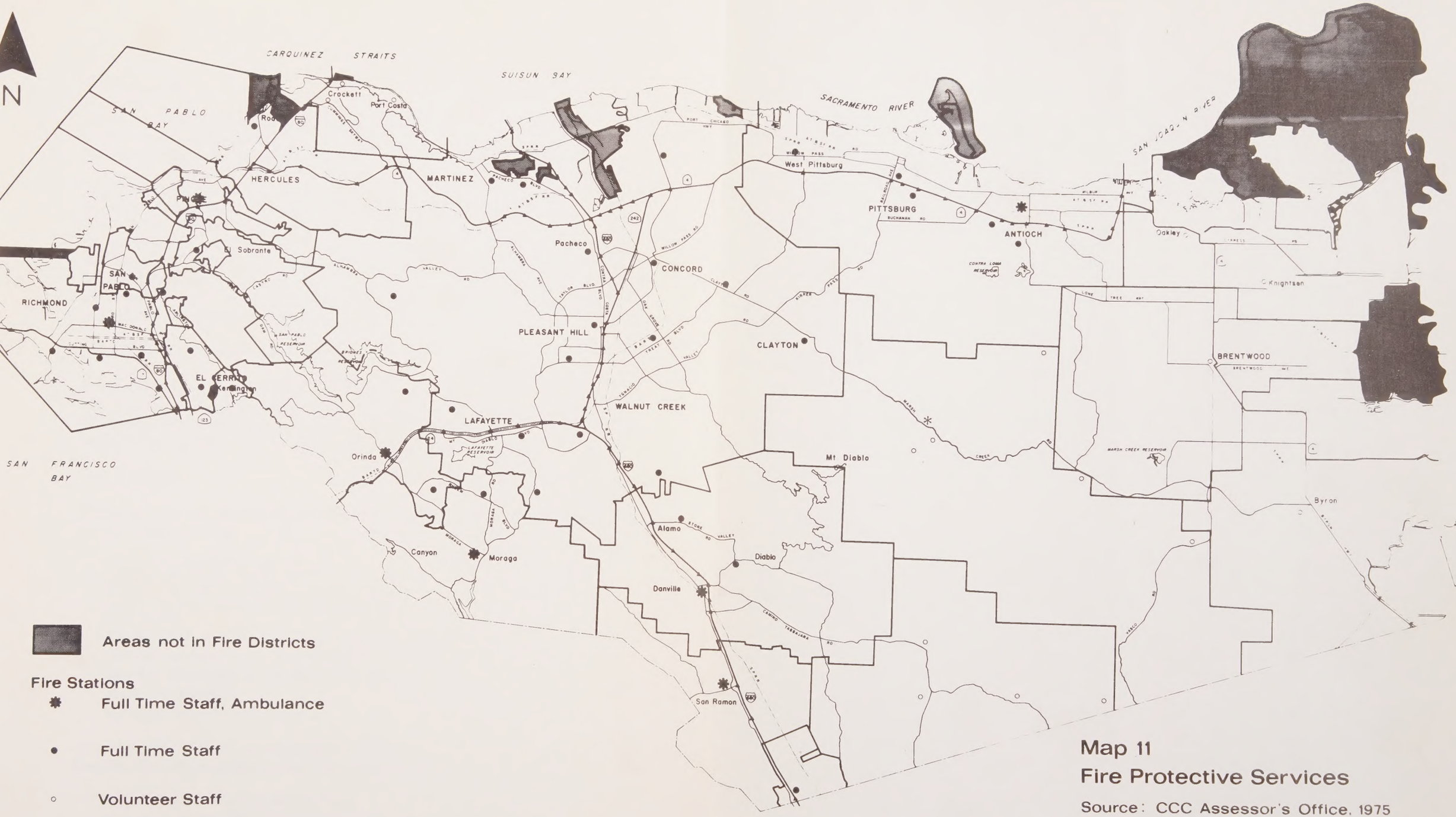
A big fire usually cannot be put out at its peak but only in the early stages or at a late stage after most of the fuel has been consumed. This is true of both structural fires and wildfire. In a major structural fire, fire fighters often concentrate on preventing the spread of the fire to adjacent buildings until it has burned down to a degree that extinguishment procedures can become effective. Any land development pattern or structural design feature which may hamper the rapid response of fire fighters adds to the risk of life loss and severe property damages. Delays from traffic congestion may occur when fire trucks must travel across town during peak traffic hours, or, in a disaster situation, as a result of the collapse of freeway overpasses or by evacuation efforts by large numbers of persons.

Isolated or widely spaced homes set in wooded canyons or ridge tops, with wells as the sole supply of water and accessible by only one narrow, winding or steep road, are not only subject to a high fire hazard from environmental conditions, but also carry a high risk of severe damages should a fire start because of inadequate water supplies for fire fighting on the property and poor accessibility to public fire fighting services.

Fire Services

Fire services are provided by the Cities of Pinole, El Cerrito and Richmond. Other areas are served by County or autonomous districts. The Valley Community Services District serves portions of Contra Costa and Alameda Counties. Additionally there is a California Division of Forestry fire station on Marsh Creek Road. Some industrial properties and agricultural islands are not included in public fire service jurisdictions (Map 11). Fire fighting personnel vary from all volunteer or partly volunteer to entirely professional staff.

Mt. Diablo State Park and the parks of the East Bay Regional Park District have fire fighting equipment and trained staff, as do the Concord Naval Weapons Station and major petroleum and chemical industries. City fire services and fire districts are prepared to extinguish structural fires and wildfire. All have tanker trucks to be used in areas which do not have a municipal water supply, and districts which include large rural or undeveloped areas also have 4-wheel drive trucks for negotiating steep roads and fire trails.



Areas not in Fire Districts

Fire Stations

- ✸ Full Time Staff, Ambulance
- • Full Time Staff
- ○ Volunteer Staff
- * Division of Forestry Fire Station
- ▲ Freeway Overpass

Map 11
Fire Protective Services

Source: CCC Assessor's Office, 1975
CCCPD, 1975

Safety Programs

Fire prevention programs include property inspection for fire hazards such as piles of trash, enforcement of weed abatement regulations in grasslands, maintenance of fire trails, and public education.

Each city service and district has a Fire Bureau formed from its staff to review projects to insure that: (1) there is an adequate peak load water supply for fire fighting, (2) road widths, road grades and turnaround radii are adequate for equipment, and (3) that structures are built to the standards of the Uniform Building Code (UBC) and Uniform Fire Code (UFC) regarding the use of fire-retardant materials and the incorporation of detection, warning and extinguishment devices. These requirements are being met throughout the County. Mutual Aid Agreements have been signed by all jurisdictions.

POLICE SERVICES AND CRIME PREVENTION

It is not a purpose of this element to deal with crime as such, but there are planning-related opportunities to aid in the efficiency of police services and incorporate crime-reducing features into development projects which could result in greater public safety at relatively little public cost.

Police Services

Police services are provided by a number of agencies from several government levels. These include;

Federal Bureau of Investigation
California Highway Patrol
Contra Costa County Sheriff's Department
City Police
Kensington Police District (in unincorporated Kensington)
East Bay Regional Parks District Police
East Bay Municipal Utility District Rangers
State Park Rangers
Bay Area Rapid Transit District.

Several communities in the unincorporated County have formed County Service Areas for Sheriff's programs beyond that normally provided. They are;

P-1, Crockett. Parking enforcement.
P-2, Part of Danville. Additional patrols and programs for juveniles.

P-4, Orinda. Additional crime investigation staff and education for crime prevention.
P-5, East San Ramon Valley. Additional patrols and crime investigation.

Local government jurisdictions and service areas are shown on Map 12.

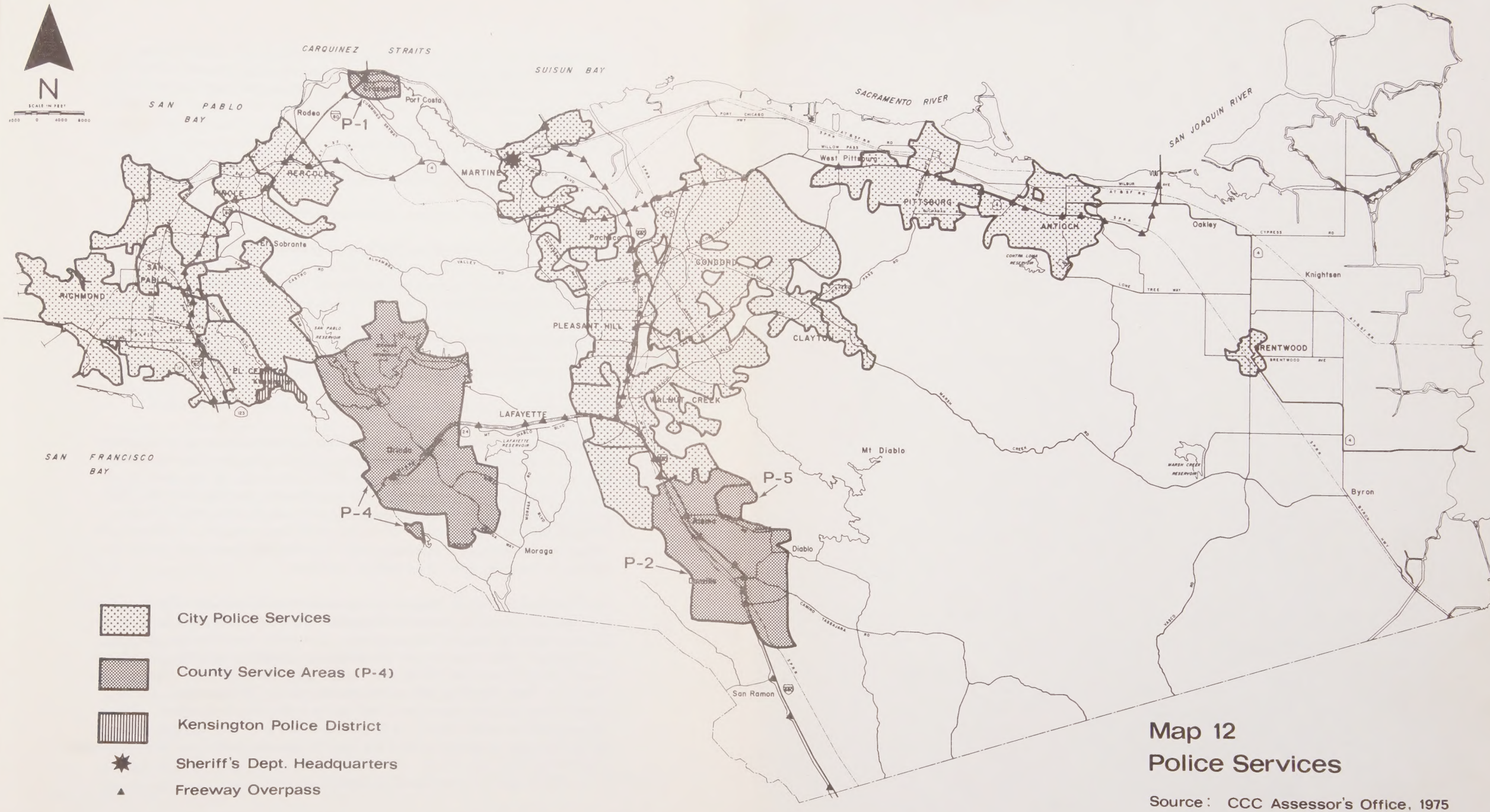
Protection of specific property is undertaken by:

Contra Costa County Housing Authority.
Military property.
Industrial and commercial property (private patrols).
Residential developments (private patrols).

In some locations jurisdictional boundaries, either unincorporated "islands" lying within cities or awkwardly shaped jurisdiction areas cause confusion and delay response to day-to-day emergencies. It is often not immediately clear if the City or Sheriff should respond to a call, and the Sheriff can be greatly delayed when he has to cross through congested downtown areas to reach an unincorporated area. Uncoordinated street name and numbering systems and unit numbers not clearly visible also cause delay in response times. Jurisdictional problems are under study by the Criminal Justice Agency of Contra Costa County which will make recommendations to the County Board of Supervisors. Mutual Aid Agreements have been signed by the Sheriff and all police forces.

Crime Prevention by Citizen Action Program

In most suburban neighborhoods theft is perceived as a greater hazard than crimes of violence, and statistics indicate that burglary rates are on the increase in suburbs. Although the reasons for this increase are not precisely known, it is believed to be related to the increasing number of homes which stand empty during the day, economic stress, and a large population of persons in the crime-prone 12 to 20 year age group. Additional hardware such as locks, bolts, and alarm systems (target hardening) can partially reduce the risk of theft, particularly by the casual passer-by, but target hardening is much less effective against the professional or determined burglar. Citizen action is a more effective means of preventing theft. Walls and grates around subdivision developments or apartment complexes are more a symbolic separation from general society than a deterrent to crime.



Map 12
Police Services

Source: CCC Assessor's Office, 1975

Defensible space is a concept of designing buildings and neighborhoods to promote the proprietary interest of the residents in neighborhood activities, permit the identification of suspicious circumstances and persons, and indicate to the potential criminal that he would have a high risk of apprehension.

The principles of defensible space include:

A visually well defined separation between public and private areas.

Well lighted and windowed apartment stair wells.

Apartment corridors accessible from only one exterior entrance.

Windows placed for easy resident surveillance of entryways of public and semipublic areas.

Absence of interior hiding places.

Short streets ending in cul-de-sacs in single-family residential areas.

Landscaping to permit surveillance of open areas and entryways.

These design features were shown to provide a greater degree of crime deterrence than did target hardening in urban public housing developments which were studied. The principles are more difficult to apply in low-density suburban or semi-rural areas where the desired lifestyle requires features which separate each home from the others and from the road, thus making it very difficult for a family to watch out for the neighbors' property. In these areas citizen action within the existing physical setting has been shown to be effective in reducing theft and crimes of violence.

The Neighborhood Alert program sponsored by the Contra Costa County Criminal Justice Agency includes fostering acquaintance among neighbors, an attitude of care for neighboring properties, permanent identification marking of household items, and signs on the property indicating valuable items have been marked (Operation I.D.). Two weeks after Neighborhood Alert was instituted in West Pittsburg, all crime was reduced by fifty percent. Other participating neighborhoods have had similar reductions in burglary. Major changes include unwillingness of thieves and fences to take marked property and an increase in phone calls to the Sheriff reporting suspicious circumstances.

The additional services provided by the Sheriff in County Service Areas are reported to be successful, with a higher percentage of arrests and/or lower juvenile crime rates, according to the functions of the Service Area.

Under a Federal Law Enforcement Assistance Administration grant, the County maintains a consolidated Drug Strike Force pilot program. If it continues to be successful, its evaluation at the end of the three year pilot program is expected to lead to proposals for other Countywide consolidated police functions.

MEDICAL EMERGENCY SERVICES

Medical emergency services are provided by hospitals, ambulance companies and fire district (Map 13). Considerable thought and planning have gone into efforts to improve responses to day-to-day emergencies and into planning for a general disaster response capability. Several problem areas remain which require improvement to enhance public safety. The Office of Emergency Services, fire districts and ambulance firms agree on the nature of problems in providing efficient service. Identification of streets, house numbers, and townhouse and apartment units ranks as a major factor hampering locating the patient.

A hazard to life which is increasing in the County as multi-story buildings continue to be constructed is the difficulty of moving patients down narrow stairways. Multi-story buildings are not required to have elevators or stairs designed for the gurney, which is the preferred method of transporting patients to ambulances because it permits the patient to lie down and permits medical crews to administer continuous treatment. Moving the patient down narrow flights of stairs in a folding chair is an additional risk to the patient and is also hazardous to the crews. In a general disaster this hazard could affect many persons.

Because hospitals are normally located in intensely developed areas, and because freeways are used for urban arterial circulation, there is a medical safety hazard from the collapse of freeway overpasses in a disaster. The San Ramon Valley and the communities of Lafayette, Orinda and Moraga are particularly vulnerable to being cut off from hospitals in an earthquake disaster because there are no easy alternative routes to hospitals.

Safety Programs

All hospitals have auxiliary power equipment. A 200-bed packaged hospital for disaster use, provided by the Office of Emergency Services (OES), is located

Map 13
Medical Emergency Services

Source: CCC Health Dept., CCCPD, 1975

at Delta Memorial Hospital in Antioch, and thirty-four packaged first aid stations provided by the state are located throughout the County. The OES is making a survey and assessment of schools in the County to determine their potential as mass medical care and shelter facilities for post-disaster recovery.

The County is served by a total of thirty-seven ambulances, an average of four units for each 84,000 persons as compared with the state minimum suggested standard of four units for each 150,000 persons. Private companies have twenty-eight units, and fire districts have nine, seven of which are older backup units which are used only if no other service is available. Two fire district ambulances, one each in Danville and Moraga, are in regular service. Fire district ambulance services are restricted to the area of the respective districts. Private company ambulances may respond to calls from anywhere, and also transport patients on a non-emergency basis, which is not a function of fire districts.

All ambulances are equipped to local and state standards. Fire stations and ambulance companies have additional emergency equipment available. Fire engine companies without ambulances respond to medical emergency calls with fire engines, but do not transport patients to hospitals because fire engines are not equipped for this service.

Most fire district and ambulance company crews have a minimum of Emergency Medical Treatment (EMT-1) training, an advanced first aid rating. A few firms also employ Licensed Vocational Nurses, Registered Nurses, and paramedics. Some fire district personnel are interested in having paramedic training (EMT-2) for engine companies so that a higher level of patient care can be given while waiting for an ambulance to arrive.

PUBLIC PROTECTION SERVICES AND PLANNING FUNCTIONS

Planning by several agencies and organizations is required for public protection services and disaster response. The coordination of these programs is the responsibility of OES. A particular need is a City-County cooperative effort, through OES, to define evacuation routes and alternate routes for emergency vehicles. Route designation should also include an evaluation of points at which traffic congestion could be expected in a general disaster. The State Department of Transportation has no present plan to evaluate state highway overpasses in Contra Costa, but given the dependence of emergency and evacuation traffic on the security of highway structures, this program is needed.

The County Planning Agency, and related departments of County Government such as Public Works and Building Inspection, can take several actions to increase public safety. These include incorporating emergency and crime prevention features into public and private buildings, continuing to enforce the provisions of the Uniform Building Code and Uniform Fire Code, adopting code improvements promptly, and reviewing project layouts and general plan areas with reference to the public protection and crime prevention concepts delineated in this Element. In order to have an adequate reference for wildfire hazards, the Planning Agency should also prepare Fire Hazard maps for presently unoccupied areas according to the criteria of the State Division of Forestry.

The principles of "defensible space" are relatively new. Guidelines for crime-prevention design of buildings, site layouts, and landscraping have not been entirely established or tested. As part of its design review function the Planning Agency, in cooperation with the County Sheriff, should develop guidelines for assessing crime-reducing features of developments. These guidelines can be applied to public buildings and commercial districts, and can be referenced for major subdivision developments to ensure that crime-inviting features are not inadvertently incorporated into new neighborhoods.

Volunteer fire departments can not be expected to cope with the larger number of fires which will occur in highly urbanized areas. Thus, proposals for large increments of residential or commercial growth in presently rural areas should be reviewed with reference to the possible need for professional fire fighting services and provisions for its accomplishment. Major developments should not be approved unless the area can be provided with adequate fire fighting service.

Specific fire detection and extinguishment features are required by the Uniform Building and Fire Codes for buildings over 75 feet high (approximately seven stories). Buildings lower than 75 feet but over three stories high may present problems to fire fighters and may also hamper evacuation by the occupants. These moderately tall buildings require review by the Fire Bureau to insure that fire detection and fire extinguishment can be rapid. This may include features incorporated into the building and/or adequate access for men and equipment from the exterior.

POLICIES FOR PUBLIC PROTECTION SERVICES AND DISASTER PLANNING

1. The Office of Emergency Services, in cooperation with the Cities, should delineate evacuation routes and, where possible, alternate routes around points of congestion.

2. The Office of Emergency Services, in cooperation with public protection agencies, should delineate emergency vehicle routes for disaster response, and where possible, alternate routes where congestion or road failure could occur.

3. The State Department of Transportation should be advised to evaluate the disaster safety of freeway overpasses and bridges and make any needed structural improvements to insure the mobility of emergency vehicles and the accessibility of mass care centers.

4. In cooperation with the Cities, the County should undertake a program to unify street name and numbering systems.

5. In order to insure prompt public protection services, dwelling unit numbers should be required to be easily seen from the street or road.

6. Development of areas identified by the criteria of the State Division of Forestry as having an Extreme Fire Hazard should be avoided where possible. Homes located in extreme or high fire hazard areas should be constructed with fire-resistant materials and the surroundings should be irrigated or landscaped with fire resistant plants.

7. Projects which encroach into areas which are determined to have a high or extreme fire hazard, or which incorporate wildfire hazard areas, should be reviewed by the appropriate Fire Bureau to determine if special fire prevention measures are advisable.

8. Major developments should not be approved if fire fighting services are not available or are not adequate for the area.

9. Plans for office and residential buildings over two stories in height should be reviewed by the Fire Bureau to determine that fire prevention and extinguishment features are adequate, and that fire fighting accessibility is adequate.

10. In order to reduce the risk of crime at little public cost the County should encourage the use of citizen action programs such as Neighborhood Alert and Operation ID.

11. The Planning Agency in cooperation with the Sheriff's Department should develop guidelines for Defensible Space design of buildings and major subdivision projects, and should review projects to insure that crime-inviting features are mitigated.

12. The County should require adequate access for medical emergency equipment in high-occupancy buildings of over two stories.

OTHER HAZARDS

The Safety Element is not intended to consider all possible hazards to life, safety and health. Many hazards are present in every day life, and many of these are mitigated to some degree by public programs. The following items are worthy of consideration as public hazards, but are not discussed in detail in this Element because they are not general or widespread hazards, are more closely related to health than to safety, are the province of a special group of agencies whose work is not directly related to physical planning, or because information is not sufficiently available to make reasonable evaluations of the risks to public safety.

Air Quality

Contra Costa County is part of the Bay Area Critical Air Basin identified by the State Air Resources Board. Health hazards are known to result from air pollution. Property damages include corrosion and a shorter life span for rubber, metals, and paint, and also damages to crops and livestock. The Bay Area Regional Air Quality Control Board regulates and grants permits for stationary sources of emissions, while the State Air Resources Board controls vehicle emissions.

Air quality problems in the County vary depending on topography and location with respect to the wind. The major agricultural region of the East County is not only subject to damages from vehicular air emissions generated locally, but is downwind from the north shore industrial district and thus also receives air pollutants from those sources. The highly urbanized central valley corridor is subject to concentration of vehicular emissions because of poor atmospheric ventilation in summer and fall, and also suffers from the production of oxidants in the atmosphere because of the sunny weather. The lower San Ramon Valley, a northerly extension of the urbanizing Livermore-Amador basin of Alameda County, suffers the highest oxidant levels in Contra Costa. Property and health damages are not well documented at present, but because air pollution is a known phenomenon in the County, it should be a factor in land use and resource planning.

Ground Fog

All parts of the County are subject to dense ground fog during winter and spring. Although these frequent "tule fogs" cannot be controlled, the risk of traffic collisions is severe enough to warrant keeping toxic, corrosive, explosive, or otherwise hazardous substances off highways and road during

tule fogs. The California Highway Patrol, in granting permits or as part of regular patrols, could materially reduce the risks of public exposure to hazardous materials by requiring that these substances not be transported when fog obscures visibility.

Water Recreation

Recreational boating is increasing in County waters. Not all boaters are experienced enough to deal with emergencies caused by swift currents, tule fog, stalled engines, or collisions. Persons engaged in water recreation may become lost in the winding sloughs of the Delta, or through ignorance they may damage or degrade the levees which are vital to farmland safety. Federal and state agencies and the five-county Delta Advisory Planning Council are presently involved in planning and preparing for the heavier use of Delta waterways anticipated in the future. Swift currents hazardous to small craft occur in Carquinez Strait and off Point San Pablo near the Brothers Islands. Experienced local fishermen are wary of the Brothers area, but the inexperienced boater could get in trouble there. These risks are not now of a magnitude requiring local government action.

Sabotage

As an industrialized County with petroleum refineries, chemical plants, power stations and power lines, a weapons station, many miles of underground fuel lines, and aqueducts and major water reservoirs, Contra Costa is susceptible to life loss and property damages from deliberate antisocial acts as well as from accidental disasters. This implies that evacuation and emergency response plans for the population generally are extremely important here, and that utility districts, the military and industry should have contingency plans including identification of areas or installations of greatest vulnerability. Without exposing such information to general view, it is important to understand the potential public safety hazard from sabotage directed at a specific installation, and to recognize the need to coordinate private sabotage prevention plans with plans for the safety of the public generally.

Disease Vectors

Disease organisms in water used for recreation and fishing have been of concern to the nation for many years. The Regional Water Quality Board determines whether or not lakes and offshore waters are suitable for fishing and contact sports such as swimming. Control over land-based disease vectors includes the County Department of Agriculture (ground squirrel eradication), the County

Health Department (flies and rats) and Mosquito Abatement Districts. Other agencies act on an emergency basis; examples are the Statewide program to innoculate against equine encephalitis in 1972, and emergency programs to innoculate susceptible persons against anticipated flue epidemics. The Animal Control Division, Department of Agriculture, states that better control of family dogs, cooperation in the licensing program, and control of stray or abandoned pets would decrease the risk of transmitting rabies from native wildlife to humans. None of the above hazards to health are at present perceived as a severe risk to public safety, yet the potential for a disease outbreak is ever present. The County should support programs for control of domestic pets and disease vector control programs.

Nuclear Power Plants

The safety of nuclear power plants has not been clearly established and is disputed despite the assurances of federal agencies. Although no such plant is at present proposed for Contra Costa County, any future proposal should be given full public hearings with disclosure of all relevant information.

Agricultural Chemicals

The County Department of Agriculture controls the use of agricultural chemicals. Crops grown in Contra Costa have an excellent record of pesticide residue conforming with federal limits for the many different toxic substances used on crops. However, there is no agency specifically assigned to determine the potential public health risks from these substances either in the agricultural regions or to consumers. The United Farm Workers and other groups have documented cases of deaths and disabling injury to crop workers in close contact with concentrated amounts of toxic substances, but there is no widely accepted evidence on long-term risks to the public generally.

The hazards noted above are not at present the direct concern of the planning agency. However, they are appropriate for discussion in Environmental Impact Reports for public and private projects, and thus should be addressed in public documents brought before the County Planning Commission for its finding on the adequacy of these reports.

IMPLEMENTATION

It is the aim of this General Plan Element to provide an acceptable degree of public safety from certain specific environmental and man-made hazards, recognizing that not all existing and potential hazards to life and property are included in the Element, and recognizing that an environment entirely free of the hazards discussed in the Element cannot be achieved.

The Element establishes a framework for public safety considerations in the General Plan while retaining a balance with the several other mandatory General Plan Elements. The adopted policies of the Element provide that framework. Hazard evaluation and existing program evaluation in the text supplement these policies and aid in their implementation.

Section 65860 of the Government Code requires that "County or City zoning ordinances shall be consistent with the General Plan of the county or city by January 1, 1974." In the event that a zoning ordinance becomes inconsistent with a General Plan by reason of amendments to such a plan, or additional consideration introduced through subsequent elements to such a plan, the zoning ordinance must be amended within a reasonable time so that it is consistent with the General Plan as amended or expanded. Although this Element does not itself establish amended or new types of land use or zoning categories, it is recognized that as adequate information becomes available on areas of extreme geologic, flood and wildfire hazards, land use and zoning may be revised to reflect these hazards. An extreme natural hazard is an avoidable risk, with safety achieved by refraining from exposing persons and property to the hazard. This will be accomplished through existing regulatory powers such as zoning. For example, a Floodway Zone will be defined when the Federal Insurance Administration prepares maps for the County designating flood elevations.

In the interim period reasonable decisions can be made by the Planning Agency based on the best information available through the normal planning process of General Plan and project review, proposed changes to General Plans and zoning, Environmental Impact Report preparation and review, and preparation of regulations. Compliance with the policies of the Element will result in a consistent pattern of decisions which take public safety into consideration, not merely in changed codes and ordinances.

Although the General Plan has referenced safety needs since at least 1963, several of the topics included in the Element are not traditionally matters of concern to planning agencies. General neglect of these matters in land

use planning is one reason why the State instituted the program. For example, exactly how regulation of radioactive materials will impact conservation and development in the County is not clear, yet exposure of the citizenry to radiation is not acceptable, but is an unnecessary and avoidable risk. The concept of building and landscape design to deter criminals has a potential for enhancing public safety at virtually no public cost. However, there are at present no standards by which to estimate whether or not new development or redevelopment is likely to be subject to an unacceptable crime rate, and thus it cannot be determined how much in environmental and social costs is an appropriate trade-off for an unspecified degree of crime risk reduction.

A number of the policies are directed to agencies which do not operate under the Board of Supervisors, including but not limited to the State Department of Health, California Highway Patrol, and Federal Insurance Administration. Failure by these agencies to respond to Element policies does not necessarily place them in violation of the County General Plan, but the recommendations indicate a serious concern for public safety in the County which should not be ignored.

The Planning Agency should consider several actions to implement Element policies, weighing hazard mitigation goals along with other desirable community goals and objectives stated in other General Plan Elements.

1. Coordination and cooperation among the several County agencies is essential for mutually satisfactory health and safety planning. The Planning Agency can actively encourage interagency cooperation in determining areas with potential water safety hazards from sewage contamination, considering solutions to the problem of safe patient transportation, developing guidelines for defensible space, and implementing other policies which are, or have been in the past, only peripherally associated with Planning Agency considerations.

2. A statement of public safety and hazard mitigation can become a part of Environmental Impact Reports and staff reports, since these are the vehicles by which environmental problems are made available for discussion by the public and the Planning Commission.

3. Community planning and project review committees and conservation and development oriented community groups can become concerned with public safety matters and can provide the necessary citizen support for acceptance of safety related programs. Advisory comments

and opinions from these groups to the Planning Commission and Board of Supervisors will provide the necessary information feedback to keep the County government continuously informed on hazards, acceptable risks, and appropriate mitigation as perceived by the residents of the County.

4. A high degree of coordinated planning is required today. The Planning Agency has the primary responsibility for conservation and development planning in the unincorporated County, and also has the major responsibility for maintaining lines of communication with a multiplicity of local, regional, state and federal agencies, districts, and citizen associations to resolve public safety issues which may result from proposed actions, to aid in formulating plans for expansion of utilities, services, and roads, the formulation of regulations and standards, and other actions for hazard reduction which could affect the safety of County residents.

   Element policies directed to government agencies other than the County should not be implemented by these other agencies alone, but should be cooperative efforts by those other agencies and the Planning Agency. For example, the significant but previously little recognized risks associated with the transportation of hazardous substances require mitigation efforts by the state and federal agencies with regulatory powers, yet mitigation must be related to information on present and planned future development available through the Planning Department.

5. The Planning Agency can consider regulatory means of mitigating hazards, including:

   A creek setback ordinance to protect property from damages from creek bank failure and flooding.

   Flood plain management regulations to implement the National Flood Insurance Program.

   A slope density ordinance to protect property from geologic hazards associated with steep slopes.

ENVIRONMENTAL IMPACT REPORT

I. Introductory Discussion

A. Project Description

The project consists of the (Public) Safety Element of the Contra Costa County General Plan. It includes goals and objectives for public safety from specific hazards, a description and analysis of each hazard, and policies for hazard mitigation. The Element includes safety hazards from geologic conditions, flooding, fire, the use and transportation of hazardous substances, water supply safety, public protection services, and disaster planning.

The proposed programs and regulations will apply to new development in the County in presently undeveloped areas or as redevelopment takes place.

B. Environmental Inventory of Region

1. Physical Description

Contra Costa County is one of the nine counties composing the San Francisco Bay Area. As such, it shares the regional mix of intensely urbanized bay shore communities and outlying rich agricultural areas. San Joaquin County, adjacent to Contra Costa's Delta on the east, is an agricultural county of the Great Valley and Delta. Alameda County, to the south, has a distribution of urban and rural areas similar to Contra Costa.

The County includes over 800 square miles of which 735 square miles are land area. The County is characterized by shoreline plains and bluffs along the west and north coasts, the northwest-southeast trending Coast Range and Diablo Range separated by relatively narrow linear valleys and, in the east County, a portion of the Great Valley of California including reclaimed lands of the Delta. Valuable wildlife and native vegetation resources exist in the off-shore waters, marsh remnants, and the low ranges of rugged hills which transect the County. The climate is the Mediterranean dry-summer type in which unirrigated vegetation becomes extremely dry and flammable in the summer and fall. The steep and unstable hillsides are highly subject to landslides, while the reclaimed wetlands are subject to horizontal and vertical movements. The valley floors and eastern plain are not subject to significant geologic risks, but may be flood prone near rivers and creeks.

Major transportation routes parallel the shorelines on the west and north, cross narrow passes from east to west, and follow the north-west trending major valley floors. Communities are strung along these routes like beads on a chain, with heavy industry concentrated on the west and north coasts.

The topography of the County, and the consequent development pattern, lead to many miles of freeways and other major routes passing through developed communities and to the transportation of large quantities of explosives and other hazardous materials trucked through communities mixed with the daily traffic. Thus, a large County population is subject to transportation-related safety hazards, including the risk of accidents involving explosive or lethal substances, and the risk of severe obstructions to disaster response and recovery.

2. Existing Uses of Land

As of January 1, 1974, over 183,000 County residents lived in the unincorporated County. This represented almost one-third of the estimated total County population of 590,000 persons. Residential areas in the unincorporated County are typically single family frame dwellings at low to moderate densities of one to six units per acre constructed on the level valley floors and coastal plains. Residential areas also exist on hillside slopes, notably in the Coast Ranges, and to a limited extent occur in the east County Delta region on reclaimed islands surrounded by levees or on the levees themselves.

Heavy manufacturing and military installations are concentrated along the west and north shores. Light industry and controlled manufacturing have begun to come into the interior cities and these areas hope to attract more such activity. Industrial safety in the use of hazardous substances appears to be satisfactory, and public safety hazards appear to be minor where there is an adequate separation between the general public and hazardous land use areas. The risk of accidents which would release toxic substances into the air or water is believed to be low, but the seriousness of such an event, should it occur, warrants the highest degree of safety which can be achieved.

Other hazardous land uses include airports, fuel pipelines, gas and oil wells. Docks projecting into recreational waters are hazardous, but do not expose the public to risks as high as hazardous materials transportation.

II. Environmental Impact Analysis

A. The Environmental Impact of the Proposed Action

The major impact of the Element would be to provide a safer environment for the residents of the County. When the Element policies are implemented by administrative action or regulation they, could, however, have several significant environmental impacts depending on the nature of the hazard and the mitigation means.

1. In order to avoid geologic hazard areas, development on steep slopes could be restricted, either by avoiding hillsides entirely or by requiring very large lot sizes.

2. To prevent flood damages, development in floodways and the Delta may be avoided rather than protected by flood protection works.

3. There would be a larger consumption of land to provide the recommended buffer between hazardous land uses and the general public.

4. To ensure an adequate domestic water supply in outlying areas, residential development may be restricted in areas where wells are required.

All of the above impacts could result in retaining presently existing open space areas in open space uses and could possibly add certain floodways and hillsides to the open space category to be used for agriculture and recreation or remain idle land.

Other impacts could include:

1. Increased water transportation of hazardous substances, which would increase the risk of water pollution.

2. Loss of native vegetation and potential increased slope instability in irrigated landscaped areas around homes in high wildfire risk areas.

3. Social impacts could include a greater sense of confidence by the public in living and working in Contra Costa, and reduced

fear of geologic events, fire, flooding, and crime. To the extent that other desirable social goals give way to safety goals, as could occur for fire and crime deterrence, the benefits of the other social goals would be lost.

4. Economic impacts could occur if areas now considered developable at high densities are determined to have only a lower development potential. These costs would be born by the property owner through the lower value of land. Public cost savings from lesser public facilities and services in hazardous areas would constitute a public economic benefit.

5. If more stringent controls are placed on the shipment of hazardous substances, the direct costs would be born by the shipping industries, but may be reflected in higher consumer costs for products. Some public costs would result from administration of the regulations.

6. All construction and transportation requires the consumption of energy. To the extent that Element implementation would require additional structural materials or more lengthy transportation routes, an additional consumption of energy would be required. On the other hand, refraining from development in high risk areas could also result in avoiding many daily trips to outlying areas, and thus could conserve energey.

B. Any Adverse Environmental Effects Which Cannot Be Avoided If The Proposal is Implemented

Loss of native vegetation to irrigated landscaping around homes in high fire hazard areas could not be avoided. Additional consumption of energy and physical resources such as metals and water, could not be avoided. Visual quality may be damaged by fire prevention or crime prevention measures. Requirements for buffering around hazardous land uses may result in idle land.

C. Mitigation Measures Proposed to Minimize the Impacts

No specific mitigation measures are proposed in the Element. The Implementation section, however, points out that some safety objectives may not be viewed as of overriding importance when weighed against other General Plan or citizen goals, and that continuing communications with residents and advisory groups will aid in defining suitable levels of safety as perceived by the community.

D. Alternatives to the Proposed Action

1. No Project

This alternative would place the County in violation of State Law, Section 65302.1 of the California Government Code.

2. A Substantially More Restrictive Safety Element

A more restrictive Safety Element with more stringent and demanding programs would result in higher monetary, social, and environmental costs for questionable additional safety benefits. Requiring extreme measures for flood control in the absence of precise information on the elevations of various cyclic floods, for example, could prove to be very costly for minimal benefits. Again, extreme requirements for landscaping for surveillance could "cost" the community trees which add to the beauty of residential neighborhoods, their climate-tempering effect, and the energy conservation in homes provided by deciduous shade trees close to buildings.

3. A Substantially Less Restrictive Safety Element

A substantially less restrictive Safety Element, or one which ignored certain hazards which could affect large populations, would represent a failure to recognize the significance of these hazards and risks to the public. Ignoring the hazard of deadly chemicals traveling along major routes along with daily traffic, for example, would be ignoring a hazard which has a life loss potential far greater than structural fires or landslides in Contra Costa County.

E. The Relationship Between Local Short-term Uses of Man's Environment and the Maintenance of Long-term Productivity

All resources allocated to hazard abatement are considered a permanent consumption of these resources which would then not be available for allocation to other uses. The development of environments with acceptably low levels of risk would add to long-term property safety and health benefits to occupants throughout the life of the various projects to which the programs are applied.

The long-term productivity of residential and business environments, expressed as freedom from excessive hazards, would be enhanced by plan implementation.

F. Any Irreversible Environmental Changes Which Would Be Involved In The Proposed Action Should It Be Implemented

Consumption of resources to provide mitigation of hazards would represent an irreversible use of those resources. Since some methods of mitigating hazards are structural, including fill above flood elevations, fire extinguishment features, fire resistant materials and irrigation systems, projects or areas provided with these features would be irreversibly provided with hazard mitigation. This is a purpose of the Element. Avoiding hazards such as floodways and unstable slopes would result in irreversible commitment of those areas to uses not requiring buildings. To the extent that future project site plans reflect hazardous conditions, the environments within such projects would be irreversibly changed from other possible plans which did not consider hazards as design factors.

G. The Growth-Inducing Impact of the Proposed Action

The Safety Element is not expected to cause either greater or lesser total growth in the unincorporated County. However, because hazards are not evenly distributed across the land but rather tend to be clustered in flood prone areas and unstable hills, the distribution of future homes and businesses would be different than a distribution which did not consider safety hazards.

H. Organizations and Persons Consulted

This Environmental Impact Report was prepared by the Contra Costa County Planning Department.

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